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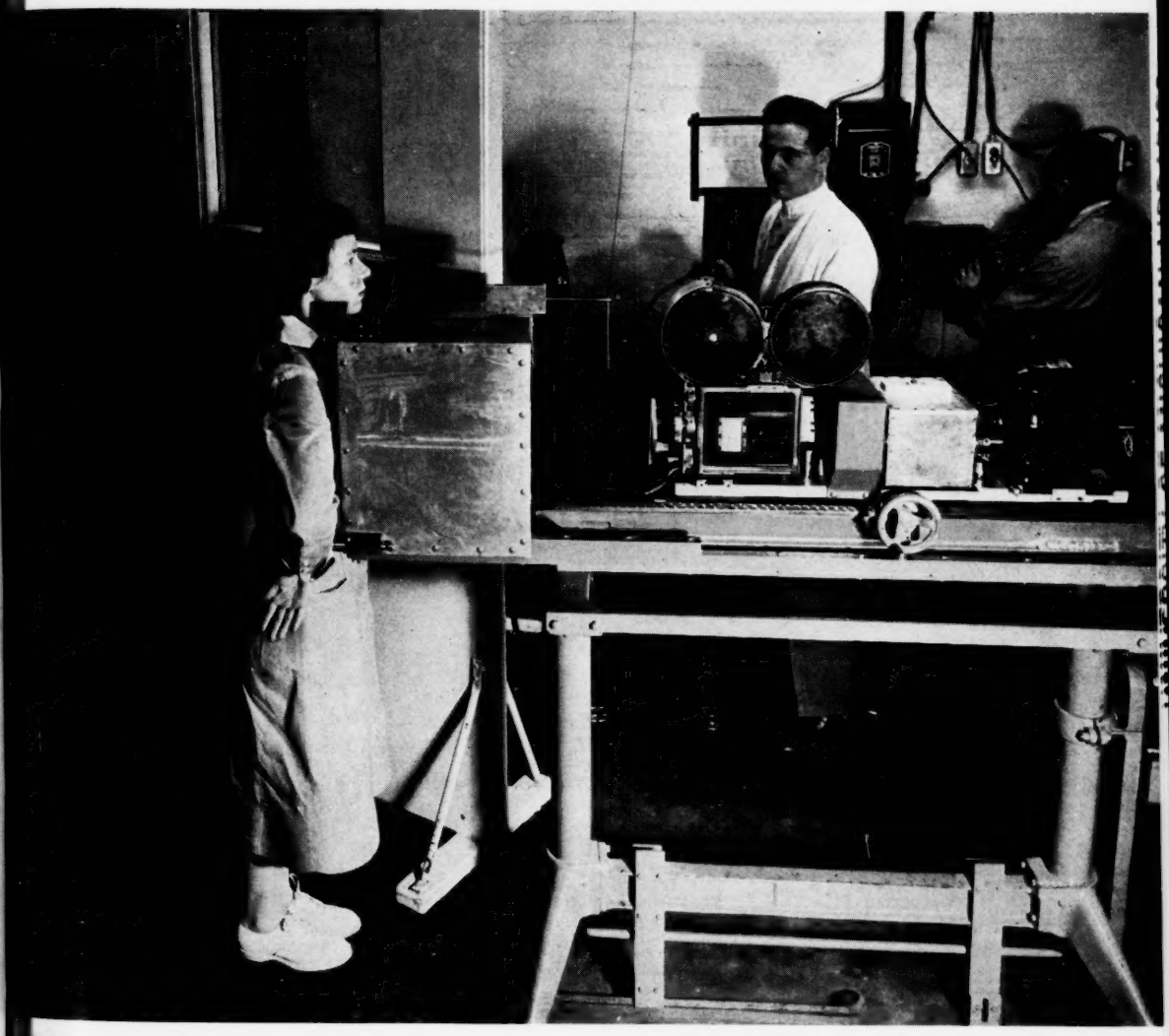

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Weinberg, Watson and Ramsey

February 1952

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The Preparation of Prints for Publication

WARREN H. GREEN*

SPACE will permit us only to mention the salient features of the subject. The multitudinous other details must await another occasion . . . either a series of articles or a book. No attempt will be made to discuss the techniques of photographic processes. Our purpose will be limited to what the result of those processes should be, if that result is intended for medical publication.

General Considerations

First and foremost, there should be a clear delimitation of function between the author, illustrator, and publisher. There should be no single occasion arise whereby one of these might say "Oh, I thought *he* was taking care of that." One hears the expression all too frequently.

All photographic prints should be made in direct proportion to the type page size of the publication in which they are to be printed. Therefore, it is essential that the photographer acquaint himself with the type page size for which he or she is preparing photographs. All photographs, if possible, should be made about 50 per cent larger than they finally are to appear on the printed page . . . and in direct proportion to that page.

The most satisfactory illustrations, from the publisher's standpoint, are those which are made to reproduce one-half the width of the printed page or the full width of the printed page. In photographing for journal or other large-page reproduction where the page will have two columns to the type page, single column or double column reproduction is most economical. Odd-sized illustrations requiring type run-arounds necessitate the resetting of type and creates not only an additional expense, but coincident delays due to the time involved in fitting the type to the illustrations.

If size is of especial importance, an author should indicate to the photographer the exact size in which such illustrations are to be reproduced.

Paper is another "must" subject for the photographer. He must know what paper is to be used in the book for which he is preparing photographs because halftone values run from 10 per cent to 100 per cent on the same screen and variations will result from the type of paper used. Tonal densities will change in direct proportion to the absorbency of the paper.

* Editor, Charles C Thomas, Publisher, Springfield, Ill. Presented at the 20th Annual Meeting.
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The screen used for halftone reproduction also should be considered. X-rays, photomicrographs, and similar illustrations containing fine detail, should be reproduced with a 133 or 150 line screen. A 110 or 120 line screen can and will be used in some publications printed on an uncoated paper because of the absorbency of the paper. Fine detail cannot be held faithfully with such a coarse screen.

Composition of a picture is also highly important. Center the important subject matter so that when cropping is necessary, the "story" is not affected.

Keep all extraneous matter out of the photographic print. Tables, chairs, vessels, towels, instruments, and above all, people, detract from an illustration.

The background never should be considered lightly in setting-up for an illustration which is later to be published. The background never must obscure nor detract from the subject matter. Backgrounds, instrument handles, equipment, and drapes, which are black, have a tendency to fuse themselves into the silhouette of the figure and become lost, unless such a contrast to a light subject is desired.

Plain cloth, white, gray, or black makes the best backgrounds. Patterns in cloth, such as herringbone, frequently cause a moire effect in a finished engraving due to the dots in the engraver's screen breaking-up the pattern of the cloth. Prominent patterns in any subject matter make accurate reproduction increasingly more difficult in direct proportion to the strength of the particular pattern and the fineness of the pattern Figure 1.

Figure 1. Prominent patterns in the subject material of the print may reproduce entirely differently in a half-tone reproduction. Note that the half-tone screen has caused a different pattern to emerge in certain areas. (Courtesy, Saving on Engraving, Basil L. Smith System, Philadelphia, Pennsylvania.)

Special photoprint papers with mat finish, linen finish or other unusual surfaces make poor engraver's copy even though they are quite pleasing to the eye. It must be remembered the engraver's camera views the photograph through a single eye and "takes" everything which it "sees," and it is relentlessly accurate Figure 2.

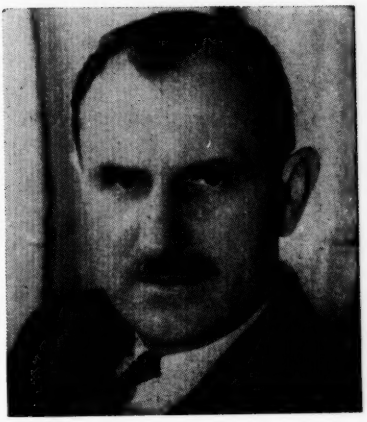

Figure 2: Special papers may result in a change in appearance after half-tone reproduction. The effect shown here was caused by the grain finish of the photoprint from which the engraving was made. (Courtesy, Saving on Engraving, Basil L. Smith System, Philadelphia, pennsylvania.)

From the subject matter to the printed page, there are from four to six transfers and reversals of the photograph. Each reproduction or transfer increases contrast in an illustration. Contrast should be controlled so that the final printing is a facsimile reproduction of the original photograph.

Insufficient contrast in tones results in flat, uninteresting halftone reproductions. It must be remembered, however, that retouching can be excessive and can result in an unnatural effect. Not only is it very expensive, but frequently it results in an illustration which has a "faked" appearance. Contrast in prints should be adequate by virtue of the photographer's craftsmanship alone and not because of the abilities of the engraver or retoucher. An engraver cannot hope to know the changes in contrast necessary in a poor photograph.

We must say a few words about lighting in taking photographs which ultimately will be printed.

Distorting reflection of light should be kept out of areas which are important to the picture as reflection distorts trueness and often necessitates remakes. By the same token, reflection should be kept off instruments, or any materials which will reflect light sufficiently to over-light or under-light the area of importance.

All too frequently illustrations which are not consistent one with the other are seen in a publication. There never should be various sizes of people in a large composite of illustrations. Frequently the same ruled background is used in photographing children and adults. Different degrees of reduction are used so that the adult is finally reproduced in a smaller over-all size than the child. Illustrations of this nature all should be reduced in direct proportion so that the smallest child will appear the smallest in the final reproduction on the printed page. Exception to this will be found, of course, where a close-up is

desired to show a particular condition. In a series of photographs of the same subject, the same background and set-up should be used wherever and whenever possible. The same size photographs should be made and from the same distance. Do not depend on an engraver or editor to scale illustrations so that in the published series the subject will be the same size. Too little background in series pictures frequently makes such scaling impossible. The photographer should attempt to position the patient as nearly as possible like the position used in the first picture of the series. One often sees a series of pictures of a particular patient where various lighting and positioning angles have been used, making it extremely difficult for an accurate comparison to be made.

As publishing is down-to-earth dollars-and-cents business and the publisher's profit is partially contingent upon reproducing illustrations in the manner which is least expensive and yet most presentable to the reader, it is wise to group illustrations wherever possible. Care must be exercised that squares, circles, and oblongs are not all grouped into the same composite of illustrations. Only figures of uniform size and tonal qualities should be grouped. It might be mentioned that where portions of large photographs are to be cut out and made into a composite, it is more satisfactory if the desired portions are cut out and mounted one part flush against the other so the composite will be square at all corners. Where one illustration extends beyond others, it necessitates mortising an engraving and this again requires handwork, time, and additional expense. These economies are of utmost importance in presenting to the reading public, books which do not bear a price prohibitive to prospective purchasers.

Where it is impossible to trim portions from the large illustrations and dry mount them as they finally are to appear, a rough layout should accompany each group to make up a composite and grease pencil marks should be placed on the face of each illustration to show the maximum amount of cropping which will be allowed.

Grease pencil crop marks always should be covered by a tissue overlay to prevent rubbing off. Only blue grease pencil and no other material should be used for marking on the face of an illustration as grease pencil can be removed easily by the publisher without defacing the illustration.

In series photographs, where the publisher is to do the trimming and mounting, the various parts of the composite should be identified on the backs of the prints as to their exact locations correspondingly shown on the layout accompanying the illustrations. A layout for such composites should be sent the publisher for each group of pictures to be so treated.

Illustrations should always be unmounted except those mounted as composites. One of the economies which can be affected by having unmounted

pictures is that a number of pictures of like tonal quality can be trimmed and photographed at one time and made into a large composite which later is cut into individual engravings. When it is possible to group, with certain reservations, a same-focus discount is enjoyed by the publisher. It is understandable that the same-focus discount can only be obtained when the illustrations to be photographed at the same time are to have exactly the same amount of reduction so that only one focusing of the engraver's camera is necessary for a group of illustrations. Large margins of mounting boards prevent utilization of same-focus shots by the engraver.

Always indicate the top of each figure. Place some identification on the back of each figure to correspond with the photographer's own filing and indexing system so that if it is necessary to request an additional print of one of the negatives, it will not require the sorting of 100 to 1000 negatives to find the proper figure. All identification and instructions should be written on the backs of the photoprints. Photoprints should be placed face down on a hard surface, preferably glass, and a soft pencil used for marking. Any indention carrying through to the opposite side of the print will reproduce in the engraving to be made from that illustration.

When illustrations are submitted to the publisher, an explanation should be given for any missing figures which will be sent after the initial shipment. Write out all instructions explaining in detail all unusual pertinent points concerned with the reproduction.

Tissue overlays should be placed over all illustrations where pertinent details are to receive special attention by the engravers. These overlays should be marked to show areas of importance before being affixed to the illustration to prevent the impression of the pencil being carried through to the face of the print. Overlays should bear registration marks which correspond to identical marks in the margins of the photograph.

In instances where a tumor, flower, or other object is to be shown and it is desirable to have the size apparent to the reader, the simple expedient of including a rule, whether in centimeters or in inches, within the base of the picture, will adequately convey size to the reader. For unusual effects, items like thimbles, eggs, spectacles, or other articles of standard sizes give mute evidence of the size of the subject by subtle comparison.

Figure numbers never should be made a part of a photograph whether these figure numbers are affixed with pen and ink or with a hole punched in the corner and an Artype letter affixed beneath the illustration.

There will be many times when a book will be carried into subsequent editions. It may be desirable on the part of the author to elaborate a bit on a

given subject and to add additional illustrations. At any time a figure number is made a part of a halftone reproduction, it reduces the value of that illustration as far as future use is concerned as it precludes all possibility of the engraving being used in any other publication where it will bear a different figure number.

Always use the pica measure in giving instructions on photographic prints. One pica equals 12 points and six picas equal one inch. Hence, there are six picas or 72 points to the printer's inch. Illustrations sized in inches frequently require trimming and coincident delays and expense when page proof is being made up by the printer.

Paper clips never should be used on halftone illustrations and there are no exceptions! The impressions made by paper clips frequently will reproduce in an engraving made from that illustration.

Scratches, blemishes, broken corners, folds, and corner tabs all tend to reduce the value of a photograph, and may even be disasterous. At all times the face of the photoprint should be smooth, clean, and perfectly flat. Any other type of photoprint should be remade before being sent to the publisher.

In labeling illustrations, avoid cut-lines. Cut-lines are captions within the illustration. These captions may change in subsequent editions the same as figure numbers.

When several illustrations are to be prepared for the same publication and all must have cut-lines, the lettering which is placed within the illustration should be in direct proportion to the amount of reduction the illustration will receive. Nearly always the same lettering guide will be used on a large number of illustrations regardless of the amount of reduction. Whereas they look pleasing to the eye before reproduction, the attractiveness is lost when a series of several photographs are printed with lettering in many different sizes.

All cut-lines should be lettered in undiluted India ink where black is required. Black labeling should be placed in light areas; white labeling should be placed in dark areas; and black, shaded by white, should be used in gray areas.

All cut-lines should be in expanded, balloon-type lettering so that after maximum reduction they still will be legible. Above all, the photographer should own a good medical dictionary and make sure that all cut-lines are spelled correctly. Typewriters never should be used for inserting lettering onto the face of an illustration. Artype lettering, on a transparent background, is not usually satisfactory. Usually, not only the lettering reproduces in halftone reproduction, but the background as well.

When cut-lines or captions must appear on the face of the illustration and extend beyond the illustration, it is well to airbrush the background out far

enough to enable these cut-lines to be engraved as part of a square-finish picture. When cut-lines are to appear completely outside the illustration, it is well to place all lettering on acetate overlays so that at the engraver's discretion they can be photographed together with the illustration or photographed separately. Such overlays always should be keyed for registration to the photograph and be lettered on transparent acetate overlays.

We might add that when several leader lines from cut-lines converge at near points within an illustration, each should start from a different angle to assist the reader in locating that which is desired. Too many leader lines make a photograph difficult to study.

In preparing photomicrographs for publication, all photomicrographs should be square, oblong or complete circles. Circles which are flat on one or more sides do not look attractive on the printed page. This can be handled quite easily by masking.

The magnification of the original photomicrograph always should be indicated on the back of the print so that when a reduction is made the corresponding change can be made to the legend pertaining to that illustration.

Photomicrographs, probably more than any other type of photograph, should be free of blemishes such as black and white spots arising from dust or other causes. Photomicrographs have been misinterpreted solely because of dust specks having been in the print submitted to the publisher.

Occasionally, the photographer is called upon to photograph graphs which have been made on standard graph paper containing a blue or green background. Occasionally, theauthor does not wish the background removed and this offers serious problems to the photographer. To the publisher, it is preferable to have the backgrounds removed by the simple expedient of filtering out the green or blue, as the lines in the background are usually very faint and necessitate the making of a halftone illustration, Figure 3.

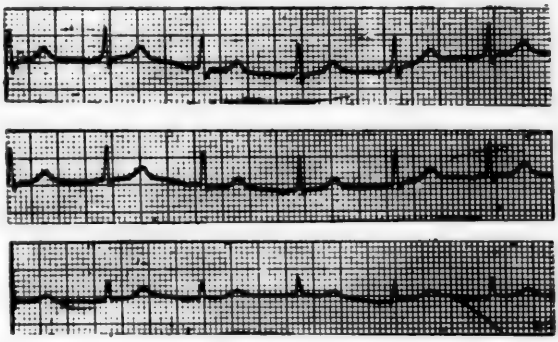

Figure 3. Pale blue or green lines of graph paper and minute lines of lie detector or electrocardiograph paper seldom reproduce satisfactorily. These lines should be filtered out when making the print which will be submitted to the publisher.

When the photographer is called upon to photograph halftone illustrations from the printed page, it would be well to be acquainted intimately with some of the methods of eliminating as much as possible of the dot pattern found in the halftone print. One of the most difficult tasks of the photoengraver is to reproduce onto metal, photographs of previously printed illustrations. An unattractive moire pattern nearly always will result from lack of coincidence of the screen dots of the first and second engravers' screens Figure 4.

Figure 4. A half-tone engraving made from a photoprint of a previously printed half-tone engraving will usually result in a cross-hatching of the dots of the two engravers' screens. The effect will vary from a spotted and muddy appearance to a strong fishnet appearance where the two screens do not exactly coincide. (Courtesy, Saving on Engraving, Basil L. Smith System, Philadelphia, Pennsylvania.)

X-rays present a problem quite different from other illustrations. Never blame the radiologist for a poor negative. A poor negative to the photographer may be the best for the diagnostician. Remember, too, the doctor has only one "try" at a good negative. The photographer has as many tries as he desires at obtaining a good print and has many more techniques at his command than the radiologist can hope to have.

Contrary to European style, it is customary in the United States to print x-rays in the negative with the bones appearing white as in the x-ray films. Of course, this necessitates going through an intermediate negative to make a negative print. As in the case of other illustrations, any reproduction increases contrast and there may be a tendency toward shading and dodging to overcome this. Shading and dodging must be done with extreme discretion at all times as it is possible to alter diagnostic value. Before shading or dodging, ask the radiologist about holding back the areas in question. Never send x-ray negatives to the publisher. Glossy prints should be sent the same as for all other photographic copy.

X-rays which tend to be "flat" or have a long scale gradation in tone, generally reproduce best. The least contrast is the best contrast. If at all

possible, keep dust, fingerprints, and extraneous matter such as initials, dates and other markings from the x-ray prints. Do not reproduce the entire print, only that part which is pertinent to the text. When making a series of photographs and corresponding x-rays of patients, be certain that the x-rays are made into photoprints in the same position as the photograph of the patient. It was a recent experience to see a book showing many skull defects. One patient was photographed in a series of two portraits and two x-rays. Unfortunately, the photographer reversed the negatives and although the skull defect in the portraits was obviously over the right eye, the reversed x-ray showed the surgical repair apparently over the left eye.

Color Reproduction

Color reproduction is very expensive, therefore, the most grouping is the best grouping as the cost of color reproduction does not increase in direct proportion to the increased size of the reproduction.

There is an added charge for making engravings from color transparencies (usually 50 per cent). When possible, color illustrations should be sent in the form of color prints approximately twice the size in which they are to be reproduced. Color prints or transparencies should be wrapped in glassine envelopes which show identification as to top, figure number, and cut-lines.

There are certain limitations concerned with color reproduction and to simplify the matter of studying the color transparency to see how it will look to the engraver's camera, the color transparency should be viewed under 3200 Kelvin. It is impractical for the average photographer to purchase a standard viewing light for viewing color transparencies. A substitute arrangement is an ordinary sheet of white cardboard, similar to poster stock, to be used as a reflector base. By arranging a 60-watt Mazda bulb so it shines directly onto the cardboard from a distance of about 12 inches, you will have approximately 3200 Kelvin light temperature. The transparency should be held between 18 and 24 inches from the cardboard, Figure 5.

Color illustrations never should be numbered with the balance of illustrative materials for a publication. It is more economical and practical to number color illustrations with Roman numerals and call them "Plates." Usually, color work is printed separately and "tipped" in a book. A separate identification enables the printer to insert these illustrations at any opportune point within a reasonable distance from the proper point of reference in the text.

To add a personal word about a long-standing argument, color correction inks are seldom satisfactory. The transparencies should contain the proper color values without the necessity for color correction.

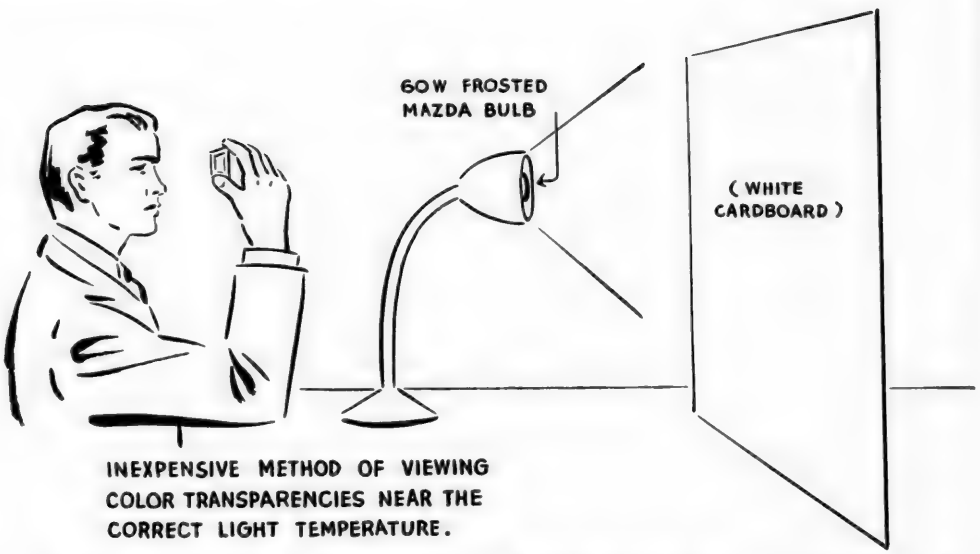

Figure 5. Arrangement of 60-watt Mazda bulb with white paper or posterboard to give approximately 3200 Kelvin light temperature for viewing color transparencies.

To make cut-lines and labels for color plates, make a black and white print of the color transparency. Place an overlay over the black and white print and insert whatever labels are desired onto the overlay. When the color separation has been completed and the color plates are made by the engraver, the materials found on the overlay will be incorporated onto the black plate. This saves much additional expense as outline and combination color plates are about the most expensive single item which an engraving plant can produce.

Color transparencies never make black and white engravings that are exactly true to the original subject matter. The bluish side of the spectrum will tend to fade out and the reddish side will come out dark. Sepia or reddish brown gives similar results. Only make black and white prints from color transparencies if there is no alternative.

Conclusion

In conclusion, it must be stressed that the attitude of the photographer should be that he knows everything and he axiomatically should assume the author knows nothing. This, of course, is not always true. However, it is true that the majority of the clients of the photographer know little or nothing of the various types of illustrative technique or reproduction. The photographer should suggest proper procedures and guide the preparation of materials.

We have not covered such items as lithography, intagilo printing, the Ben Day process or any but three of the 98 possible ways an engraver or printer can reproduce a photograph. It would take a large volume to discuss the results, advantages, and disadvantages of each.

We have attempted to limit ourselves to the preparation of prints for publication and it has been a question of what to leave out rather than what to put in. The subject matter could go on endlessly as it is actually a subject for several workshop sessions rather than for a short discourse.

Last, but by no means least, it is important to get photographs in on time! Late photographs, no matter what the reason, necessitates that ugliest of words in publishing "RUSH!"

This is the word that breeds errors, needless expense, bad tempers, and ulcers — it often has six men mixing and baking the cake which one man could have produced much more tastily under normal routine. Remember, the photographer is a co-author of every book or article he illustrates whether his name appears in the Acknowledgments, Preface, on the title page, or does not appear at all.

We once had a lovely dream about a cure-all which would eliminate the necessity of remaking engravings because of poor photographs. But we woke up. Grim reality still remains. There is no easy panacea. There are no secrets. Just the dull unoriginal method of eternally keeping your eye on the elements of good photography.

Book Review

Photo Words in Four Languages. **Focal Press, London. 63 pp. No date. 3s/6d.**

From abrasion marks to zapon varnish are found 528 photographic terms, alphabetically in English with the corresponding term in French, German and Spanish. There is an index, alphabetically arranged of the foreign words which refers by number to the English equivalent. Nine pages of questions and answers in the four languages completes the tiny volume. It will be useful to photographers when reading the literature in these languages.

Journal of the Biological Photographic Association Vol. 20, No. 1 (February) 1952

Cinefluorography at the University of Rochester School of Medicine and Dentistry: Technique and Applications.*

S. A. WEINBERG, J. S. WATSON, JR., M.D., G. H. S. RAMSEY, M.D.**

THE discovery of x-rays was reported in 1895. In the some year, at least four inventors demonstrated for the first time a less sinister innovation, the motion picture projector. This coincidence did not go unexploited for long. In 1896 Dr. John Macintyre of Glasgow was already experimenting with x-ray motion pictures and in 1897 he showed motion scenes of a frog's leg on Ladies Night at the Royal Society. There is a brief illustrated review of his work in the 1896-97 volume of The Annals of Skiagraphy from which it is clear that he anticipated at that early date most of the developments that have occurred in this field. He would probably be surprised that x-ray motion pictures are not better than they are.

During the next three decades the technique progressed slowly, accelerating in the 1930's mainly as a result of the improvement of fluorescent screens and the appearance on the market about 1934 of the Zeiss R-Biotar. During the past ten years, although screens and films have increased considerably in speed, the 17 year old R-Biotar continues to be about the fastest lens availavle. An English manufacturer has recently announced an f/0.71 lens of 65mm focal length for 35mm cameras. (Journal of Scientific Instruments, 1951.)

As an introduction to cinefluorography a few words should be said about conventional radiography, sometimes called direct radiography. The majority of medical x-rays are made on double-coated films sandwiched closely between two fluorescent intensifying screens. When excited by x-rays the screens emit violet and blue light, thus exposing the film. "No screen" films are also used for some purposes, but much more x-ray energy is required for this type of exposure.

The ideal x-ray motion picture from the point of view of definition would be made directly on full-sized x-ray films exposed at a rate of 16 or more pictures per second. The developed negatives would be re-photographed in sequence on motion picture positive film in an animation camera and the print projected in the usual way. Unfortunately there are technical difficulties which are hard to overcome. Many attempts have been made to impart intermittent

* Presented at the Boston Annual Meeting, 1951. Received for publication October 5, 1951.
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motion to strips of x-ray film ranging in width from 5-12 inches and more. So far no machine has been constructed that would take more than 4 pictures per second without frequent breakdowns. When it is remembered that the complete cycle of the heart beat often occurs in less than one-half second it will be seen that 4 pictures per second are not enough. On the other hand if 15 seconds of action were to be taken at this rate on frames 12 inches square, the resulting scene would consist of over 60 feet of 12 inch film. This would appear to be more than enough, from some points of view.

The most successful attempts at direct cine-radiography at true motion picture speeds have been made on continuously moving 15 inch roll-film exposed to extremely brief pulses of x-ray energy through the use of condenser discharge apparatus. The method is still in the experimental stage.

Our motion pictures are not made by direct cine-radiography but by the indirect method generally termed cinefluorography. The fluorescent screen instead of being held in contact with the film as in direct radiography is set up by itself in a frame between the patient and the camera. See front cover picture. The patient's chest is against the fluorescent screen. At the left is the x-ray tube, at the right is the camera and drive mechanism and the controls are seen in the background. This is like the system used in making miniature x-rays of the chest, as in mass health surveys.

The fast low-lag screens suitable for motion picture work were originally developed for fluoroscopy, and consequently their peak emission is in the green part of the spectrum near the high point of visibility for rod vision (5200 A). Their response to varying x-ray intensities is approximately linear within the useful kilovoltage range (75 to 100 kvp). For cinefluorography much more x-ray energy is required than for fluoroscopy (10 to 60 times), but even so the brightness of the screen image rarely exceeds more than a few millilamberts in the highlights, the shadows falling to a much lower level.

In most of our work we have used a Patterson E-2 screen and Kodak green-sensitive Linagraph ortho film, one of the fastest film-screen combinations available. Linagraph ortho negative film is rated by the manufacturer as having a resolving power of 95 lines per millimeter. Because of the low inherent contrast of most x-ray subjects it is the practice in cinefluorography to push film development close to the fog limit. There is also the hope that developing the film to a gamma of 1.8 to 2 will add a little to film speed. As a result of this treatment graininess of negatives and prints is quite noticeable and is sometimes blamed for loss of detail. However we have been unable experimentally to get any useful improvement in over-all resolution by resorting to slower, finer grain emulsions. This is because the resolving power of the fast

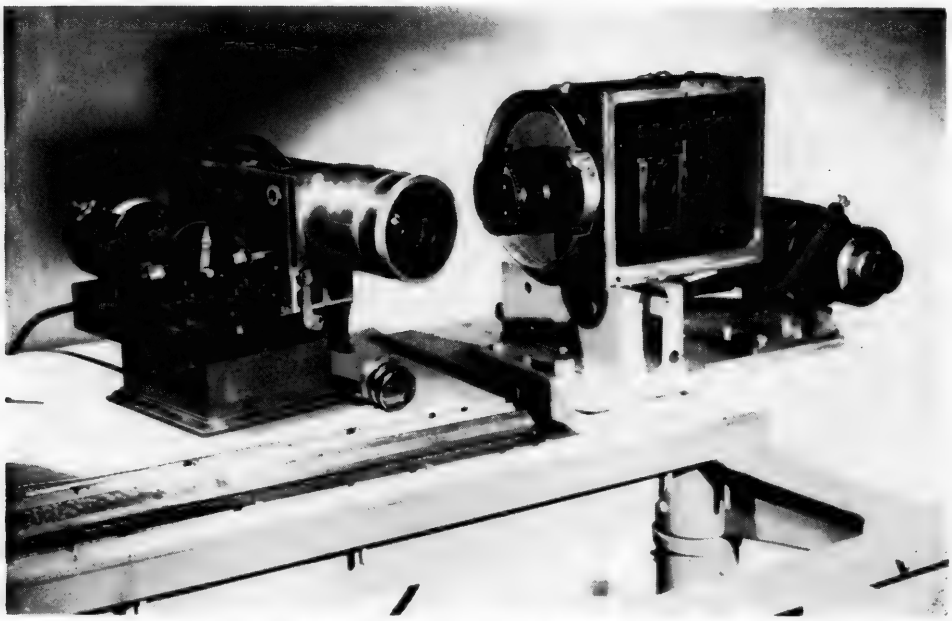

Figure 1. At left is a Cine-Kodak Special 16 mm. camera with an f/0.8 lens of 43 mm. focal length, designed by Luboshez, modified by Herzberger. At right is a Standard Bell and Howell 35 mm. camera with a 55 mm. Zeiss R-Biotar f/0.85 lens. A 50 mm. Zeiss f/1.5 sonnar lens is shown below for comparison. (Courtesy Radiology)

lens (50 to 70 lines per mm near the center of the field), is inferior to the resolving power of the fast film.

Our fastest lens is the 55mm Zeiss R-Biotar f/0.85. This lens is intended for 16mm coverage but we have extended it to "cover" the 35mm frame.

At full aperture the central three-fifths of the image is fairly flat but the outer two-fifths falls off, particularly in the corners. A better image results from stopping this lens down to f/1.4. In so doing coverage and definition are considerably improved. The fact that the lens must be refocused when stopping down from f/0.85 to f/1.4 indicates the extent of its uncorrected spherical abberation, not to mention coma. This lens is used at full aperture only when maximum speed is an absolute necessity.

A second lens with flatter field and better coverage is a 75mm Zeiss Biotar f/1.5. Many of our views of infants and extremities were made with this lens.

In cinefluorography it is the practice to take long shots and closeups, depending on the size of the part to be examined. Magnification may range from 1/6 to 1/24, with corresponding screen sizes of roughly 6 x 8 to 20 x 24 inches. At the larger magnifications a lens designed for short object distances

gives better definition. We have been using an f/1.5 Fluro Ektar lens of 117 mm focal length for magnifications larger than 1/10.

We have found that at magnifications smaller than 1/10 the over-all resolution of the unit is determined principally by the lens, and the type of screen used has little effect. At magnifications larger than 1/10 however, the resolving power of the screen becomes increasingly important. There are a number of screens which are said to give better resolutions than the E-2, and we are now in the process of trying them with a view to their use with 70mm film. With the large size film, magnification of the order of 1/3 to 1/7 would be the rule.

Our camera is a 35mm standard Bell & Howell provided with a high speed movement for camera speeds over 24 frames per second, figure 1. We consider that 35mm films offer a number of advantages over 16mm film. However, our 35mm negatives are generally printed on 16mm positive film for reasons of convenience.

The camera is driven by a synchronous motor through a gear box with a choice of film speeds of 60, 30, 15 and 7½ frames per second. Synchronism with the 120 impulse per second x-ray beam is maintained at all speeds, thus giving each frame a uniform exposure. The camera shutter opens and closes at the zero point of the alternating current sine wave. A General Electric Ignitron is used to terminate the exposure during film transport and to initiate it during the shutter open phase. The Ignition is triggered by an armature on the synchronous gear box. The primary circuit of the generator carries from 30 to 65 amperes at 250 volts. This is the circuit which is interrupted.

The pattern of exposure at various camera speeds is as follows: At sixty frames per second each frame receives exactly one impulse of x-ray energy, the alternate impulse being suppressed. At thirty frames per second each frame receives two impulses and the alternate two are suppressed. At fifteen and seven and one-half frames, four and four, and eight and eight respectively. The principal reason for interrupting the x-ray beam during the closed shutter phase of the camera is of course to lessen the x-ray exposure to the subject.

In conventional motion picture work it is generally possible to make as many retakes of a scene as are needed to get it right, but in cinefluorography it is not advisable to take more than two scenes of a particular patient without an interval of several months. The scenes average 12 seconds in length. The first factor governing the length of the scene is the chart of operating limits of the x-ray tube. At the energies required to penetrate the heart of a medium sized patient the tube current can be kept on for only 15 or 16 seconds at the longest. Then the tube must be allowed to cool for twenty minutes. The second and still more important limiting factor is the x-ray dose to the patient,

which should not ordinarily exceed 25 roentgen units measured in air at the near point on the patient's skin.

In most cases 15 or 16 seconds is ample to record a complete cycle of action. In the case of joint movement such as that of the wrist, elbow or shoulder, a few seconds is enough. The cycle, of course, can be repeated endlessly in printing or the short length of film can be spliced into a loop and viewed in this fashion until everyone is tired of looking at it.

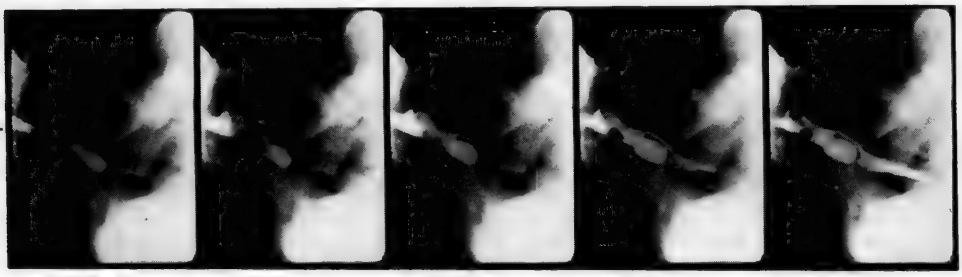

Figure 2. Diverticulum of the hypo-pharynx (Zenker's Pouch). Taken at 60 frames per second.

Applications of Cinefluorography:

There are x-ray men who feel that cinefluorography cannot compete in the diagnostic field with conventional x-ray methods because of its poor reproduction of subject detail. While it is true that there are many types of examinations in which the motion picture technique is at a disadvantage there are other types in which the aid of motion study, particularly slow motion study, is extremely welcome. In doubtful cases where it is a question as to whether a fracture is solidly united, the motion picture record is often a more reliable guide than fluoroscopy. Difficulties in swallowing and certain kinds of joint troubles are also best studied in slow motion, figure 2. Perhaps the most important and certainly the most dramatic diagnostic use of cinefluorography is in the study of the circulation of blood through the heart and lungs by the technique of angiocardiography, that is, by injecting a radiopaque solution into the blood stream, figure 3. At Strong Memorial Hospital this procedure has been used in more than 100 cases. Many are young children with congenital heart disease whose circulation is so rapid that it is impossible to follow it except by motion picture methods.

Another application of cinefluorography is in studies of animal physiology and problems of biological research. Finally there is the field of medical teaching which appears to be nearly unlimited. Frequent requests are received from this country and abroad for scenes of the heart and lungs, of the lips, tongue, palate, larynx and pharynx, the teeth, jaws, feet, wrists, elbows, knees

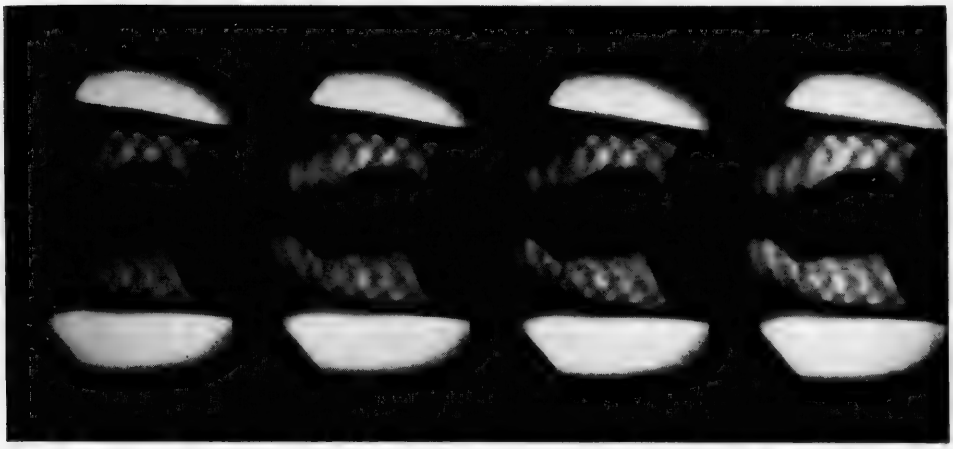

Figure 3. Enlargement of four 35 mm. frames of abnormal heart.

and spine. In fact if it were attempted to fill more than a fraction of these orders there would be no time for anything else.

In the hope of improving cinefluorographic detail we have designed and nearly completed a 70mm motion picture camera, not to replace the 35mm camera but to supplement it. The larger film is expected to more than double the fineness of recorded subject detail. However, its use will be somewhat limited because the 70mm camera will probably not run faster than 15 frames per second and also because the lens will have to be, for a time at least, a relatively slow one.

Summary

1. X-ray cinematography (cineradiography) was first successfully demonstrated in 1897, only two years after the almost simultaneous announcement of the discovery of x-rays and of the invention of the motion picture projector. Early films were made by direct cineradiography, here briefly reviewed. At the University of Rochester School of Medicine and Dentistry, our films are made by indirect cine-radiography, now generally referred to as cineflourography. Apparatus and technical factors are described in detail.

2. The application of cinefluorography in the field of medical diagnosis is limited because of relatively poor rendering of subject detail. However, the handicap is more than compensated in certain kinds of examination where the recording of motion is essential. These include studies of disturbances of swallowing and of congenital heart disease by the use of opaque media. The usefulness of cinefluorography in biological research is considerable and in

medical teaching is practically unlimited. It is expected that the introduction of 70mm apparatus in the near future will improve definition.

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Lantern Slides

Various Journals have carried articles recently calling attention to the inexcusably poor lantern slides used at some national meetings. The following references may be of use when you make this type of illustration:

Z15.1-1932. Engineering and scientific charts for lantern slides. 10 pp.

Z38.7.5-1948. American Standard Methods for testing projection and printing equipment. 1 p.

Z38.7.14-1949. American Standard Specifications for lantern slide projectors. 2 pp.

Z38.7.16-1947. American Standard Methods for determining resolving power of lenses for projection for 35mm slidefilm and 2x2-inch slides. 1 p.

Z38.7.19-1950. American Standard Dimensions for lantern slides. 1 p. (See our *Journal,* 1950, 18:177.)

Z38.7.20-1950. Proposed American Standard Practice for lantern slide and slidefilm projection. 2 pp.

The above may be purchased from the American Standards Association, 70 E. 45th Street, New York, N. Y.

Antwerpen, F. J. 1943. Preparation of lantern slides. *Chem. & Eng. News.* 21:1445-1448.

Bonnell, L. S. 1949. Preparation of effective lantern slides. *Chem. & Eng. News.* 27:2600-2606.

Eastman Kodak Co. Data Books, *Slides.* 4th ed. 48 pp.

Hewitt, R. M. 1937. Tabular and textual lantern slides. *J. Biol. Photogr. Assoc.* 5:167-185.

Pelt, J. R. van. 1950. Lantern slides and such. *Am. Sci.* 38:450-455, 465.

Yarnold, G. D., and L. Heath. 1945. Lantern slides of line drawings. *Nature* (Lond.). 156:574.

How to Show Exact Magnification in Photomicrography, Photoprojection and Publications

GEORGE R. JOHNSTONE *

THE determination of magnifications by photographing the stage micrometer through a microscope is a convenient and accurate method which does not appear to be in common usage. This procedure has advantages particularly for the beginning or amateur photomicrographer not occurring in the two methods usually recommended: one, projecting the stage micrometer on a ground glass plate in the focal plane of the camera (Shillaber, 1944), the other, by measuring the distance between the ocular and the focal plane of the camera (Sadler, 1944). Both of these methods require the use of simple, mathematical formulae after the measurements are made.

The photomicrographic procedure of determining magnifications has a high degree of accuracy, if certain definite but simple specifications are met. These specifications require that all of the adjustments of the microscope, such as the length of the tube, the combination of ocular and objective, position of the microscope adapter in relation to camera and microscope, and most of the adjustments of the camera shall be identical for photomicrographing the stage micrometer and the object whose magnification is to be determined. If the magnification of the photomicrograph of the object is changed by using a different combination of ocular and objective, then a new photomicrograph of the stage micrometer must be made under this new combination of adjustments to determine this new or changed magnification. An example will illustrate the procedure. If a photomicrograph is made of the 0.1 mm. scale of the stage micrometer, a simple measurement and calculation may be made to determine the magnification. Merely measure the distance in mm. between two adjacent lines in the photomicrograph and divide this distance by 0.1 mm. In my work using 35 mm. Kodachrome slides, two spaces were measured, (Johnstone, 1951) equaling 22.5 mm., divided by 0.2 mm. gives 112.5X which is the magnification of both photomicrographs: that of the stage micrometer and that of the object, figure 1, taken under identical conditions of adjustment of the microscope, microscope adapter and camera. The same principles controlling magnifications in photomicrography also apply to photoprojections.

The magnification of photoprojections of photomicrographs on the screen are easy to determine by the double-projection method. Separate mounts of the

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Received for publication, August 6, 1951.

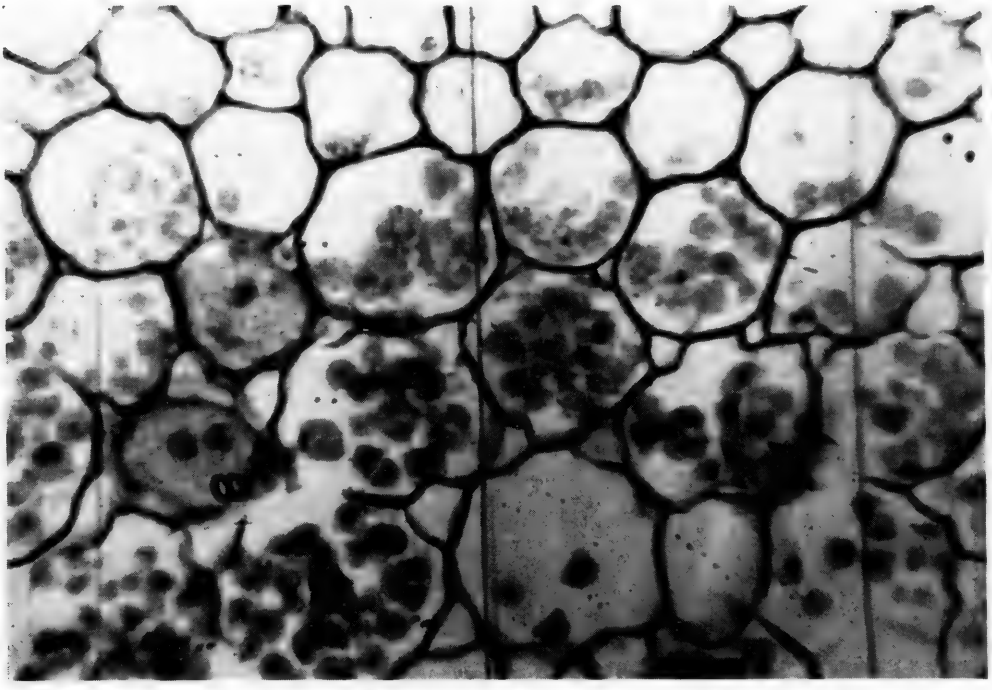

Figure 1. The root cortex of **Ranunculus acris**. The distance in mm. between two parallel lines multiplied by 10 gives the magnification.

photomicrographic transparencies of the micrometer stage and the object taken under identical conditions of adjustments of the photographic equipment can be projected simultaneously on the screen. Most, if not all, 2″ x 2″ projectors will accommodate two card-board mounts of Kodachrome slides. In black and white photomicrography positive transparencies can be prepared by double-printing of the negative of the micrometer scale superimposed over the negative of the object to be projected and whose magnification is to be determined. The magnification of such a double-printed transparency when projected on the screen is easy to determine, Compare Figure 1. Kodachrome transparencies of stained sclereids (Johnstone, 1951) were also prepared. The micrometer scale of 0.1 mm. was enlarged on the screen to 500 mm., by calculation the magnification is 5000X.

The above techniques for determining magnifications apply conveniently in publications. Once the photomicrographs of the stage-micrometer scale and the object have been prepared, your choice of one of two procedures may be employed. First, the double-printing method already described can be used to record permanently the magnification regardless of enlargements or reductions

which frequently occur before the final publication is complete. This is true because the permanent record changes with the enlargement or reduction. A new calculation is necessary for each change, enlargement or reduction. This calculation is very simple if the 0.1 mm.-scale micrometer is used consistently; merely measure, in mm., the enlargement or reduction of the 0.1 mm. space and multiply by the factor of ten (10), and the product will be the magnification. The particular stage micrometer scale should be provided as a part of the caption accompanying each photomicrograph, thus making possible its magnification at any time. If this double printing method is undesirable for any reason, then chose the usual method of determining the magnification by calculation from the photomicrograph of the stage micrometer scale. Then this calculated magnification will be that of any other photomicrograph of an object taken under the same conditions of adjustments of the photomicrographic equipment. This magnification is added to the caption of the photomicrograph used as an illustration for publication.

Thus there appears to be a relatively simple procedure of determining magnifications which may be designated the photomicrographic method, and which is applicable to problems in photomicrography, photoprojection and in publications of photomicrographs. Presumably the techniques are best suited for the 35 mm. cameras. It is expected that adequate information has been given so that modifications of the procedure can be made to meet specific requirements of particular problems. The method is accurate and recommended for beginning and amateur photomicrographers.

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Sadler, Albert. 1944. Some Aspects of Photomicrography. The J. Biol. Photogr. Assoc. 12(3):161-172.

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Equipment Available

For sale: Cinephotomicrography outfit complete with electric release control and time multiplier for automatic single frame exposures at any desired interval. B & L Microscope, camera stand, beam splitter or observation eyepiece, and B & L 6-8 volt ribbon filament lamp with transformer. Uranium glass focusing block, galvanometer and photocell for determining exposure. All for $1100.00. Also camera stand and lamp house for still photography $50.00. Write R-358 c/o Editor.

Copying Microfilms

MARGARET MARKHAM*

PHOTOGRAPHY has by now invaded so many phases of professional and industrial activities that it is not surprising to find the music classroom no exception. A prominent professor of music at New York University had devised a simple and inexpensive method for copying microfilms. The most famous musical scores in the world are thus available to anyone at small cost.

The advantages are manyfold. Instead of leaving his home laden down with volumes of musical scores for lecturing, he merely slips a 35 mm. strip film container into his pocket and has a whole symphony in a form that can be seen and enjoyed by the entire class. While his students listen to a phonographic recording of the music itself, the score is simultaneously projected onto the screen, page by page.

Numerous invaluable original scores, impossible for the average person to own or even see, are thus copied from microfilms by means of a Leica and a simple home-made set-up. Rare volumes treasured in foreign museums are thus made available to music lovers for leisurely study. There is no storage problems for stacks and stacks of music sheets. The entire works of Bach, for example, when copied and rolled up in strip film form, occupy a drawer no larger than 11 x 14 inches. A small cabinet is ample space for the professor's entire collection, comprising all the lesser known as well as more popular scores of all the composers.

The microfilms, themselves, covering a wide range of subjects, are available through the libraries and Federal Agencies, either on loan or at a small cost.

Equipment and Technique for Copying

Any ordinary tool box approximately 6 x 6 x 16 inches will serve as the "shadow box", figure 1. In the center of the lid, a piece of opal glass about 2 x 2 inches is inserted. Over this is mounted a strip film carrier, such as may be found on an Argus 35 projector. Two metal spools with brass standards are mounted at either end of the lid in line with the opal glass and the strip film carrier. One spool holds the microfilm and the other acts as a take-up spool as the film is run through the carrier. Two pieces of chamois skin are glued down on either side of the opal glass, to form strips along which the film can be rolled without scratching.

*207 E. 15th St., New York 3, N.Y.
Received for publication August 29, 1951.

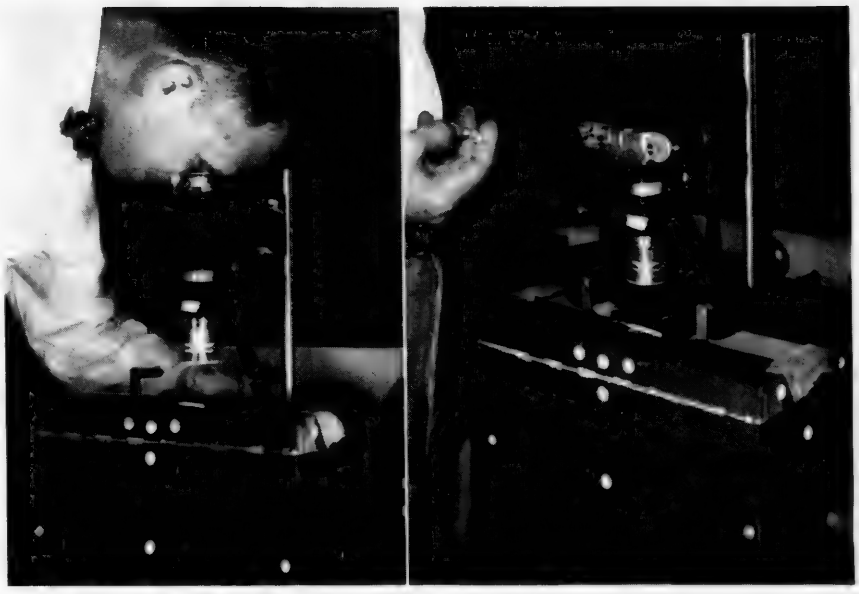

Figure 1. Left. Professor Bernstein shown checking focus through ground glass magnifier on Shull copying attachment. Right. Making the exposure with the cable release, Leica in position over copying box with microfilm carrier.

The inside of the tool box is wired with two sockets opposite each other in the long sides of the box, but one socket to the left of the center and the other socket to the right of the center, in such a manner as to permit two bulbs to lie side by side, but facing in opposite direction, figure 2. Two opal enlarger bulbs #211 thus mounted give the even illumination required. A switch is mounted outside one end of the box to permit turning both bulbs off and on readily.

The Leica, with sliding, copying, focusing attachment, or any camera with ground glass focusing is mounted onto a regular copying stand or enlarger stand. Extension rings up to 105 mm. length, with occasional addition of a + 10 proxar lens will provide the required degree of magnification.

Positive film is used to provide the direct transparency. An exposure of 3 seconds, plus or minus, is required at f/6.3, in order to obtain a transparency for projection purposes. A cable release must be used to prevent jarring the camera during the time exposures. By trial and error method, a series of exposures must be obtained by each photographer because the subject matter recorded on the microfilm will vary in its density. For copying line copy, Microfile is preferable to positive film. (The microfilm is threaded through the strip film carrier, emulsion side down away from the lens.)

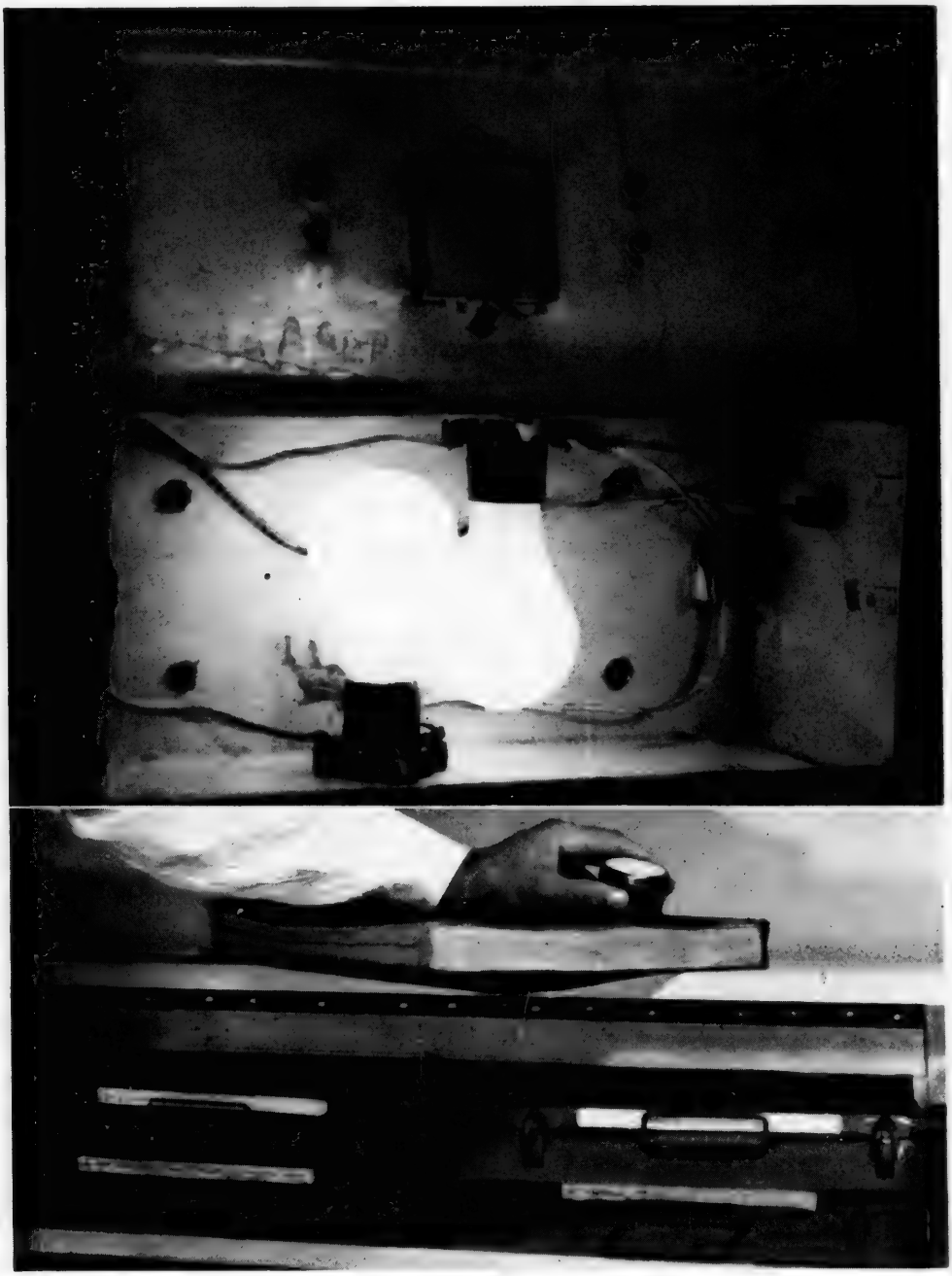

Figure 2. Top. Copy box open to show placement of opal enlarger bulbs. Bottom. Comparative size of film strip in metal container and original volume from which it was copied. Drawers contain film cans for storage.

Many camera owners may already have "shadow boxes" similar to the one described above and may be able to adapt them for the copying of microfilms. The procedure can be readily standardized by each photographer, and since the entire copying process may be done with ordinary room illumination on, no special darkroom is needed and no intermediate processing of negatives is required. The processed positive film may be used in strip form or bound up into individual slides in regular glass binders.

Professor Martin Bernstein, New York University, who devised the above apparatus and technique, informed the author that he has been able to add many rare items to his slide collection by means of copying the microfilms. For example, the Nazi regime published in 1944 a facsimile of Beethoven's Fifth Symphony. At the end of the war, a Library of Congress search team went to Germany and succeeded in securing one copy of this facsimile. Professor Bernstein promptly sent for a negative microfilm of that same work and immediately made slides of the passages of most interest to him. Slides of rare engravings and of manuscripts of considerable rarity have thus found their way into the American classroom.

[Editor's note. This method may be used for biological and medical material. Many microfilms from libraries may not be copied legally and the photographer is warned not to copy any copyrighted material without permission. This limitation would not apply to material not copyrighted or owned by the institution where the photographer may be employed.]

Compulsory Movies of Surgery Advocated

"A move is on among the world's leading surgeons meeting in Paris to make it compulsory that motion picture photographs be taken of all surgical operations.

"One of the chief supporters is Dr. A. L. Soresi, noted Brooklyn, N.Y. surgeon who says it would help make surgery a more precise science.

"Dr. Soresi and a number of other surgeons are seeking to have the idea adopted by the fourteenth congress of the International Society of Surgeons attending a week-long session here.

"'It's a sound idea,' said Dr. Soresi. 'And it will eliminate much of the guesswork which now exists.'

"The photographs which may be still as well as moving, would constitute a permanent record, not only for the surgeon, but for the examination and scrutiny of future students, and would point the way to improvements in technique, he declared."

(New York Times. *New York, N.Y.* v. 101. September 25, 1951. p. 3)

Submitted by H. B. Tuttle from "Notes from the Current Mail." October 19, 1951 .

Trends in Medical Illustration

PETER HANSELL*

FORTUNATELY for many, the time has now passed when pointing a box camera at a medical subject resulted in a praiseworthy medical photograph. Editors of journals are rejecting illustrations as being unfit for publication; doctors may demand that their work be done again; scientific photographers, on the other hand, are requiring more money and equipment for their work. Thus standards in medical photography are becoming established, figure 1.

Figure 1. Meningocele and Hydrocephalus as recorded by photography in 1920 and 1950.

During the evolution of these standards our individual approaches to the subject have been changing. A general comparison of the methods of approach encountered in America, the Continent, and Great Britain reveals enormous differences; but ideas concerning future development seem to be confused. A short review of the existing situations will help to clarify this point.

United States of America.

A well-known American scientific photographer once remarked: "Realize that anything spectacular in the way of photography done in America is achieved by the very weight of equipment owned and by the amount of sensitive material

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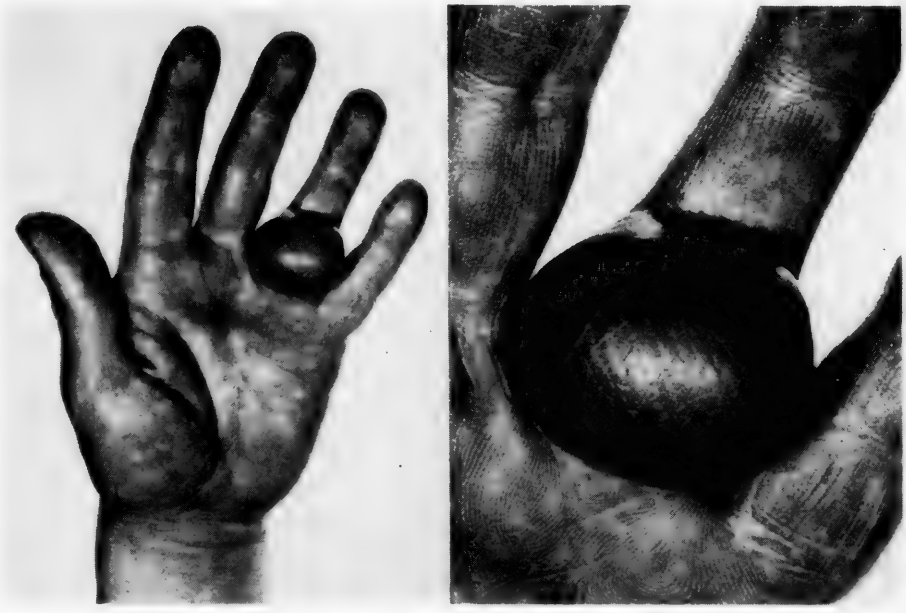


Figure 2. Bigger — but better?

expended. Do not believe the man who says that anything was done in one shot". If this be true, it is hardly surprising to find "multi-photography" practised to absurd limits in the medical sphere. For example, the production of three to five 7" x 5" color transparencies for every two to be eventually used, or the complete replacement of conventional pathological museum specimens by color transparencies. Throughout, the scale of operations is large and unrealistically expensive: although not the rule, illustration departments of 13 rooms—and containing as many staff—are to be found. Figure 2.

Offsetting this, however, no expense is spared in the production of exhibition or teaching material, but there must remain an enormous proportion of wastage in terms of records which are never used.

The Continent.

In direct contrast to the United States there seem to exist few full-blown medical photographic or illustration departments on the Continent. The scale of practice is much less ambitious, but none the less effective. Here, as nowhere else, we find the individual "doctor-photographer" very much in evidence: it is common for a doctor or university-worker to produce his own material in its entirety or, at worst, to delegate—yet closely supervise—the more technical procedures.

This approach results in minimal wastage, for the majority of material is produced for a clear-cut purpose, and not because the existence of a special department must be justified and "it might be a good idea to have a photograph taken". This individual attitude can never be capable of development to a mass-production level, but it usually means that the small output will attain superb quality both in subject-content and execution: time is of secondary importance, so that equipment may be roughly constructed or modified as the occasion arises. The practice of color photography is restricted on account of the cost involved; multiple exposures of the same subject on color film are rarely seen.

Great Britain.

In Britain we find a state of affairs which lies mid-way between the two extremes mentioned above. There is still some state of flux, for the rapid developmental phase which followed the war has not yet subsided to a stable level. In relation to the size of the country the existing number of specialist departments is large. These occupy from one to eight rooms in various centres, with a staff numbering from one to twelve full-time workers: there is often a disparity, however, between size of premises and staff.

In general it may be said that demands made of these departments are greatly in excess of the subsequent use which is made of their products. There is therefore a considerable element of wastage. It follows that the seeming lack of photographic research may be due to the pressure of maintaining a day-to-day service.

Color photography is practised fairly extensively, not so much on account of the quality of the results, but because "competitive" departments use color or because some member of the medical staff has admired with envy some transparencies supplied to a colleague.

* * * * * *

It is obvious that, for comparative purposes, the above remarks are of an extremely general nature and exceptions must exist in all three locations. They are offered, however, as a basis upon which to examine developmental possibilities in Britain in particular. As has been mentioned, we find ourselves in a mid-way position: yet it is difficult to imagine that we lag behind the United States of America in this field, or that we have effected any advance on the Continental approach.

At a time when— in the face of a controlled Health Service—the cost of every clinical investigation is rising, it is not easy to consider medical photography as anything but a luxury, however valuable it may be. If wastage of effort and

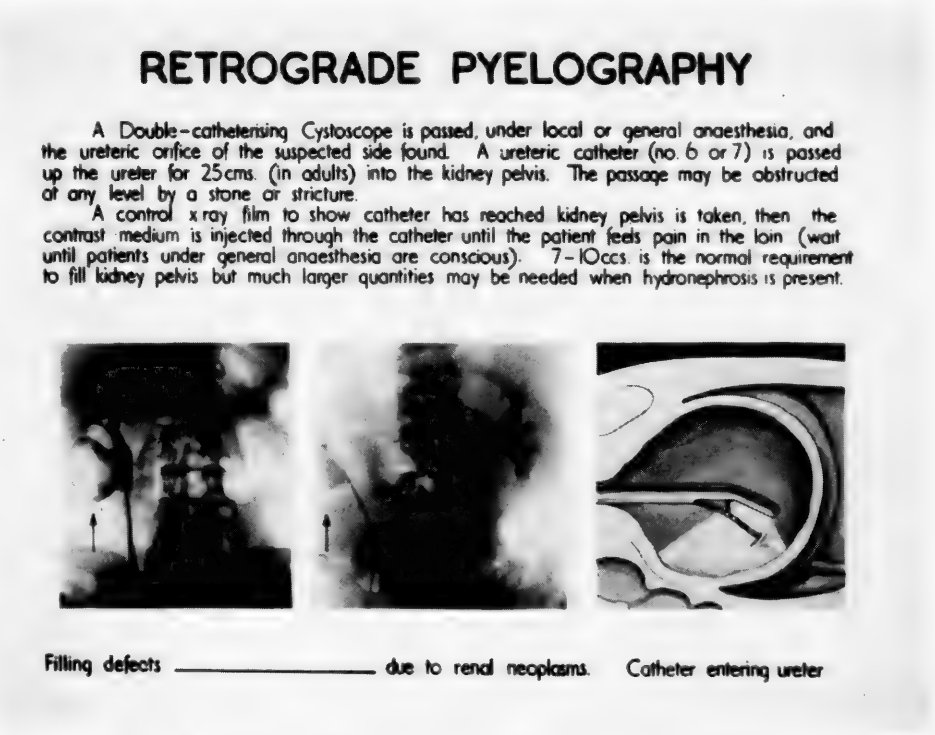

RETROGRADE PYELOGRAPHY
A Double-catheterising Cystoscope is passed, under local or general anaesthesia, and the ureteric orifice of the suspected side found. A ureteric catheter (no. 6 or 7) is passed up the ureter for 25cms. (in adults) into the kidney pelvis. The passage may be obstructed at any level by a stone or stricture.
A control x ray film to show catheter has reached kidney pelvis is taken, then the contrast medium is injected through the catheter until the patient feels pain in the loin (wait until patients under general anaesthesia are conscious). 7-10ccs. is the normal requirement to fill kidney pelvis but much larger quantities may be needed when hydronephrosis is present.
Filling defects due to renal neoplasms.
Catheter entering ureter

Figure 3. Simple combined work of draughtsman and photographer.

materials is to be curtailed, development should aim at greater uniformity of quality and purpose rather than physical expansion.

In general, departments may be said to have sought and maintained their reputation on either quality of work or quantity (i.e. a swift and comprehensive service). Each of these methods appears to meet with success, but unfortunately the two approaches are opposed to such an extent that neither can provide the real answer. It is here that the Continental university medical man has every advantage: he requires no production statistics to pacify ultimate authority; the quality of his work is of his own making, and in this he exercises intelligent discretion, for he knows exactly when twenty mediocre photomicrographs, taken with a miniature camera, will illustrate his point better than one 10″ x 8″ contact print, made under ideal conditions but requiring the same amount of time to produce. His approach is selfish, however, and it would be a mistake to suppose that his efforts should, or could, be woven into the pattern of a large photographic department.

In every country there must also be medical men who cannot tackle their own illustrations without the help of a colleague or technical assistant. Where

photographic departments exist an appeal may be made by these people for expert advice. It is pitiable indeed that the photographer's advice may be eclipsed by obsessions relative to either quality or the month's production figures, but how much worse is it when the man fails to understand the subject-matter which is to be depicted.

There is nothing novel in these observations; they are reflected in the medical and technical literature of the parent countries. Dealing more closely with this subject there is the *Journal of the Biological Photographic Association* from America, *Camera Obscura* from Holland, and now *Medical & Biological Illustration* from Britain, not to mention a host of other contributions. From these writings it should be possible for us to surmise future lines of approach and thus avoid costly, and perhaps meaningless, expansion. There is still a real need for original ideas in medical photography, and not merely an adaptation of existing techniques to our particular work.

Possibly too the time is not far off when medical artists will work freely with photographers in illustration as an integrated whole. The importance of such fusing of work cannot be over-emphasized, and fears that one may supplant the other are groundless. There should be a measure of agreement between the two regarding the division and application of their various skills, but until this is effected one aspect of development at least must be shackled, figure 3.

I wish to thank the Nuffield Foundation, the Medical Research Council and my own staff without whose help these observations could not have been recorded. I am also grateful to Miss S. Treadgold for providing figure 3.

Book Review

Fundamentals of Optics **by Francis A. Jenkins and Harvey E. White. McGraw-Hill Book Company, New York. 1950. xi+647 pp. $7.00.**

The second edition is enriched by the addition of a section on geometrical optics. This includes discussion of light rays, lenses, mirrors, prisms, aperture stops, lens aberrations and optical instruments. The second section comprises physical optics and includes light waves, interference, diffraction, gratings, light sources and their spectra, absorption and scattering, polarization phenomena, magneto- and electrooptics. Part three is quantum optics and photons. Problems are given and the even-numbered ones have answers. The book now offers a well rounded treatment of optics and would be of use to the photographer seeking knowledge in this field. The treatment of instruments is rather skimpy, e.g. under phase microscopy there is no consideration of absorption and only two types of diffraction plate are considered. Very few references are given to the literature, altho the book is well indexed.—OWR

Association News

Film News, November-December 1951 devoted nearly a page to a review of the Boston Annual Meeting.

The leading article in a recent British Medical Journal was the lecture our former President, Dr. Farris, gave last summer in London on problems of fertility. All three of his motion pictures were shown.

Dr. Robert Ollerenshaw writes to call attention that credit for the monochrome, clinical print should go to the Staff of the Photographic Department of the Royal Infirmary, Manchester, England rather than to the patient as inadvertently printed in the November issue page 173.

Mr. Murray H. Toback, medical photographer for the Flower-Fifth Avenue Hospital received a bond and Certificate of Award for a black and white print in the recent Popular Photography contest.

Dr. Romain Vishniac's polarization color photographs were featured in Life Magazine last year. He described his method at Philadelphia in December, to the annual meeting of the American Society of Zoologists.

Chapter News

With the addition of the Philadelphia and Rochester, N. Y., groups, there are now eight officially recognized Chapters of the B.P.A. Over the past few months most of them have been very active, and there is a growing trend toward recognition of the reciprocal interests between Chapters and the National Association. This spirit has been promoted at recent Annual Conventions, and the growing number of requests for information regarding forming new chapters attests to this interest.

For the information of members, there have been inquiries of this nature from: Denver, Houston, Memphis, New Orleans, Pittsburgh, Rochester, Minn., Salt Lake City, and San Francisco. Those who want to know the moving spirit in these areas can find out by writing to Warren Sturgis (Address below). A mimeographed sheet of suggestions for anyone interested in starting a new chapter is also available from the same source.

The *Boston Chapter,* having dug out from the complicated process of running the 1951 Convention, reports a meeting on October 23, at which Cleo Babcock discussed questions of camera and equipment care.

The *Chicago Chapter* lists four meetings this past autumn, including a tour led by Mrs. Inez Porter through the new photographic department at St. Luke's Hospital, a discussion by Tony Kuzma on making negative lantern slides of charts and graphs, a talk by Ralph Creer on "Recent Developments in the Production of Motion Picture Films," and a highly successful Christmas Dinner, where films of Dr. Paul Hollinger and Charlie Lindsay were shown.

In September the *New York Chapter* held an informal get-together, followed in October by Harry Parker's talk on "Electronic Flash in Scientific Photography," in which he gave a rounded presentation of its present uses and future possibilities. The November meeting was addressed by Dr. Frank Back, who spoke on "Illumination Problems in Microscopy and Photomicrography," illustrating his interesting talk with slides. The Annual Salon and Equipment Exhibit was held on December 6, as usual at the American Museum of Natural History. Good publicity and the hard work of the committee resulted in an attendance of several hundred, and commercial displays by most of the important manufacturers of photographic equipment. Dr. Roman Vishniac for the second time in succession won the annual first-place award in the Salon for his excellent color transparencies and photomicrographs.

The *Northern Ohio Chapter* has held regular meetings during the autumn, ending with a Christmas Dinner where Hungarian food was consumed in large quantities. Other evenings were spent at the Cleveland Clinic, at the Escar Motion Picture Laboratory, and at the studio of Joseph Schechtman. Newly elected officers in December were: President, R. J. Krumhansl; Vice-President, Robert Newhouse; Secretary-Treasurer, Joseph Merva.

At the Directors' Meeting in September the *Philadelphia Chapter* was welcomed into the B.P.A. and awarded its charter. Organized last June, this Chapter is now functioning successfully under the following officers: Chairman, R. L. Chapman; Vice-Chairman, W. J. Taylor; Secretary-Treasurer, A. J. Latven. In November a symposium and discussion on photomicrography was held at the University of Pennsylvania, and was attended by a large number of photographers and microscopists.

The *Rochester N. Y. Chapter* was formed last spring. With abundant photographic material in the locality and many B.P.A. members connected with the various institutions and manufacturing companies, this was a logical development. As officers, the following were elected: Chairman, J. J. Beiter; Vice-Chairman, H. L. Gibson; Secretary-Treasurer, J. A. Gaughan. Meetings have been held in the Color Room of the George Eastman House, and topics discussed recently have been "Color Photography and Materials" by H. C. Colton, a symposium on photomicrography led by C. S. Foster, John Butterfield and Roger Loveland, as well as motion pictures shown by Harris Tuttle and Charlie Foster.

Some of the interesting reports always come from the active group guiding the *Southern California Chapter.* So many topics were taken up in the recent months that only a few can be listed here. Outstanding demonstrations were given by Avis Gregersen on "Tissue Preparation for Photomicrography," by Dave Gillette on the Fastax Camera, by Ernie Brassels on "Cinematography of Ant Life," and by Dr. Albert Fields on "The History of Medical Illustration." A Christmas Party, with motion pictures and a "Grab Bag," was held on December 20. Whether cameras were donated to the grab bag was not mentioned! The members have expressed their pleasure that the 1953 Annual Convention will be held in Los Angeles, and are looking forward to giving everyone a royal welcome.

The *West Virginia Chapter* holds one Annual Meeting each year, in association with the West Virginia Academy of Sciences. The last one was held April 27-28, 1951, at Marshall College, in Huntington, W. Va. Topics discussed ranged from "Projection Slide Preparation," "Photography in Biology," and "Photography of Wild Flowers," to "Photographic Aids for the Radiologist." Several motion pictures were shown, and members attended the other meetings of the Academy of Sciences. A portable exhibit board showing B.P.A. activities and samples of members' work has been prepared, and is reported to be causing considerable interest in the centers where it has been on display.

WARREN STURGIS, *Chairman,*
Chapter Committee
314 East 46th Street,
New York 17, N.Y.

Effect of Photoflash on Vision

To the Editor: —

A woman, 37, inspects photoflash bulbs for defects and also contact integrity. This requires her being about nine to 12 inches from the bulb, and on occasion these "flash out", the intensity of this light being received in full force by the inspector. During a night shift she is exposed to about three of these. Will this eventually be detrimental to the vision?

Answer: —

Radiant energy from a flash bulb may be divided into three groups: (1) short (ultraviolet) rays, which are arrested by the media of the eye and do not

reach the retina, (2) the visible rays, which are focused on the retina, where they break down the visual purple and other chemicals to produce the visual sensations of light and color, (3) the visible rays plus the longer infrared rays which produce heat in the retina.

When any one of these is present in excess, there are characteristics results. An excess of ultraviolet produces, if acute, superficial damage of a characteristic type; if chronic, it produces cataract. The visible rays in excess so exhaust the supply of visual chemicals as to cause a scotoma lasting until the supply can be replenished. Visible rays plus infrared rays produce excess heat that may result in necrosis with permanent scotoma (ecilpse blindness). It has not been shown by any reliable research that an excess of visible rays, can, if repeated often enough, damage the cells that provide the visual chemicals and so produce retinal damage. It seems plausible to assume that in time such overstimulation of the retina would result in destructive anatomic changes. At present it is an unproved assumption. It would provide an apportunity of extraordinary value if the history of a number of employees engaged in this work were followed and reported. It is certain that neither the ultraviolet elements of the flash bulbs nor the heat effects would cause retinal damage. The heat exposure is too brief to raise the temperature to the point of necrosis, and moderate warming up of tissue stimulates normal metabolism very effectively and beneficially.—From the Journal of the American Medical Association, August 11, 1951, 146(15):1456. Reprinted with their permission.

Letter to the Editor

"Your statement on page 165 of the current issue of the Journal undoubtedly invites comment, as does the follow up letter from Harris Tuttle.

"It is obvious that money for the B.P.A. will come only from members, old and new. I therefore suggest that, in addition to the drive for new members, contributing members, and gifts, the following two points be placed before the membership:

1. That an amendment to the Constitution, whereby a new class of membership be added, namely: Life Membership, be written up and presented in the manner provided in the by-laws. This membership fee should be $100.
2. That each member be requested to name the B.P.A. a beneficiary in his will.

"The first point would undoubtedly bring in quite a bit of ready money a year from now.

"The second point would be a long term source of revenue. Inasmuch as we lost four members last year (1951), and since statistics show that we will lose more this year and every year, a small legacy would provide further gradual financial assistance.

"Had I not been absent from the convention, I would have presented these points from the floor; and since distance was too great, and crystal balls of spurious value, your invitation to help make a better B.P.A. is cheerfully received. It might be a good idea to throw open a page or two for membership correspondence.

"Cordially and sincerely, Albert Stadler, F.B.P.A."

(Received December 6, 1951)

[*Editor's Note.* Harris Tuttle has also proposed establishing a life membership. Some societies are avoiding this type of membership as in inflationary times the interest earnings fail to pay for the member's dues.]

How To Get To Los Angeles In 1953

HARRIS B. TUTTLE, F.B.P.A.

During the business meeting at the Boston Convention, September 14, 1951, a vote was taken for the site of the 1953 Convention.. Los Angeles, California was selected by an overwhelming majority.

Dr. Richards asked me to look into the transportation situation and submit a report on the cost per person by the various means of travel.

It is of course very difficult to get the railroads, airlines and bus companies to commit themselves to a definite price schedule two years in advance because of the rising costs and changes in federal taxes. However, I was able to get them to submit a price schedule based upon their present rates.

By holding the Convention in Los Angeles, it is possible for BPA members to take their vacation at the same time and visit some of our national parks. For those who cannot take vacation time, the airlines provide overnight service between New York City and Los Angeles.

It will be helpful to the Convention Committee to have some information as to your possible plans and desires for a trip to the 1953 meeting. A questionaire will be included in the annual spring mailing to you and you are urged to fill this out and return it to the Secretary at that time.

Following are the various price schedules for one way and round trip accommodations. [The detailed schedules have been abstracted by the Editor.]

Suggested itinerary to Los Angeles by Union Pacific and return by Santa Fe Railroads. Tuesday: Leave New York 3:30 P.M., or Boston 11:30 A.M. arriving Chicago, Wednesday 7:30 A.M. Leave Chicago at noon, Omaha by evening and arrive Denver 7:20 A.M. Thursday. Sightseeing bus trip in morning of the Denver Mountain Parks System; afternoon free, leave Denver 5:35 P.M. Friday, 8 A.M. arrive Salt Lake City for morning sightseeing bus tour of Salt Lake City and afternoon bus trip to Utah Copper Mines and Great Salt Lake. Leave Salt Lake City 10 P.M. Arrive Cedar City Saturday 6:30 A.M. for two-day all expense tour of Zion National Park, Bryce Canyon and Cedar Breaks. Sunday 10:45 P.M. leave Cedar City and arrive Las Vegas Monday 7 A.M. for motor coach trip to Boulder City, Basic Magnesium Defense Plant, Hoover Dam and Lake Meade. Leave Las Vegas 9:15 P.M. and arrive Los Angeles 7:00 A.M. Tuesday. Wednesday, Thursday and Friday B.P.A. Annual Meeting.

Costs Per Person — Round Trip Fares

From	Lower	Upper	Compartment For Two	Dr. Room For Two	Dr. Room For Three	Coach
New York	$342.70	$325.85	$370.90	$405.50	$361.30	$209.15
Tax	48.66	46.11	52.77	58.06	51.45	28.61
Boston	355.56	338.11	384.32	420.16	374.66	217.83
Tax	50.57	47.94	54.88	60.27	53.44	29.91
Rochester N.Y.	309.55	294.20	335.01	366.75	326.49	191.05
Tax	43.67	41.36	47.46	52.25	46.22	25.89
Montreal	330.75	313.90	358.95	393.55	349.35	209.95
Tax	46.86	44.31	51.17	56.26	49.65	28.73
Toronto	300.65	285.30	326.11	357.85	317.59	189.10
Tax	42.34	40.03	46.15	50.92	44.89	25.60
Cleveland	286.45	270.70	309.20	339.35	301.35	178.60
Tax	40.21	37.83	43.61	48.14	42.44	24.03
Chicago	247.20	234.75	268.00	293.90	261.00	156.90
Tax	34.32	32.41	37.43	41.32	36.39	20.77
Minneapolis	244.15	231.50	264.95	290.85	257.95	156.90
Tax	34.87	31.96	36.98	40.87	35.94	20.77

Rates and schedules as shown in this itinerary are taken from timetables and tariffs now in effect and are subject to change. Rates as shown include round-trip fares to Los Angeles with the Pullman space desired, sightseeing, meals and hotels as mentioned. Itinerary does not include meals on train, or in cities, nor hotel accommodations while in Los Angeles. Submitted by Union Pacific R. R. Co. — Nov. 6, 1951, 626 Fifth Avenue, Suite 350, New York, New York and Santa Fe R. R. Co., 1408 Liberty Bank Building, Buffalo 2, New York.

Return trip: Leave Los Angeles 1:30 P.M. Saturday, arrive Grand Canyon 7 A.M. Sunday. Breakfast, luncheon and dinner at the El Tovar Hotel with morning and afternoon bus trips along the rim of the Canyon. Leave Grand Canyon 8 P.M. Monday en route, Tuesday arrive Kansas City 7 A.M.; leave 3:45 P.M. and arrive Chicago 7:45 P.M. Leaving Chicago that evening permits reaching the following on Wednesday: Toronto 8:50, Rochester 5:20, New York City 11 A.M., Boston 2:55 P.M., Montreal 5:45 P.M.

Alternative routes for return: From Grand Canyon to Lamy with a day in the Pueblo country and reaching Chicago 3:45 P.M. Wednesday. Or, Grand Canyon, Lamy, Colorado Springs with overnight trip to Pikes Peak arriving Chicago 3:45 P.M. Thursday.

American Airline Schedule

Listed below are the one-way and round-trip fares *to* Los Angeles

From	One-way	Round-trip	Air Coach*
Boston	$166.55	$316.50	$121.15
Buffalo	142.70	271.20	113.95
Chicago	113.75	216.20	85.00
Cleveland	132.75	252.30	106.75
Detroit	129.00	245.10	100.25
Milwaukee	118.70	225.70	89.95
Montreal (via Syracuse)	171.95	324.30	137.00
New York	157.85	300.00	110.00
Philadelphia	153.40	291.50	115.85
Rochester	146.15	277.70	117.40
Syracuse	150.55	286.10	121.80
Toronto	146.95	279.30	118.20
Washington	148.35	281.90	117.40

All fares are subject to the United States government transportation tax of 15%. Meals are served enroute with the compliments of the airlines. There is a free baggage allowance of 40 pounds per passenger, an excess being chargeable at the rate of one-half of one percent of the cost of your ticket. For $59 additional fare you may take a side trip to Mexico. Under the Family Fare Plan the head of the family may be accompanied by his wife and children not over twenty-one years for half fare, by planning his trip for a Monday, Tuesday or Wednesday.

*Air Coach — night flight without meals.

Greyhound Highway Tours, Inc.

The following 21 day itinerary is offered as an example. Should a minimum of 30 members assemble in Chicago, they offer exclusive occupancy of a coach for the trip. First day (1D) Leave Chicago 7 A.M. arrive Kansas City 11 P.M., overnight at Pickwick

Hotel; 2D leave Kansas City 8:30 A.M., arrive Flagstaff 3D 4:45 P.M., overnight at Nackard's Inn. 4D arrive Grand Canyon 11 A.M., afternoon drive along South Rim, overnight at Bright Angel Lodge. 5D leave Grand Canyon 5:30 P.M., arrive Flagstaff 8 P.M., overnight at Nackard's Inn. 6D. leave Flagstaff 7:45 A.M. and arrive Los Angeles 7:25 P.M.

Six days and five nights are then allowed in Los Angeles. No accommodations are provided in Los Angeles. Leave 12D at 8:30 A.M. arrive Las Vegas 5 P.M., overnight at Sal Sagev Hotel, leave 8 A.M. 13D to arrive Cedar City 2 P.M. and start 3 day all expense tour through Zion National Park, Mount Carmel Highway, Bryce Canyon and Cedar Breaks. Overnight accommodations at Zion and Brice — 6 meals included. 15D leave Cedar City 2:25 P.M. and arrive Salt Lake City 9:30 P.M., overnight Temple Square Hotel. 16th day free for independent sightseeing. Leave Salt Lake City 16D 10:30 P.M. Arrive 17D West Yellowstone 9:25 A.M. and start two and one-half day tour of Yellowstone Park. 19D arrive Billings 6:15 P.M., leave 6:50 P.M. to arrive Minneapolis 6:45 P.M., overnight Dyckman Hotel and leave on 21D at 7:15 A.M. arriving in Chicago at 8 P.M.

In review of this itinerary, you will note overnight rides from Kansas City to Flagstaff; Salt Lake City to West Yellowstone; and Billings to Minneapolis.

No hotel accommodations have been provided in Los Angeles during Convention time, however, we are able to do so upon request. We shall also be glad to arrange accommodations in Chicago at the beginning and/or end of the tour for those who require same.

PRICES — From Chicago to Chicago as shown in the Twenty-One Day Itinerary —

Single Room		Double-bed Room		Twin-bed Room	
$210.05		$199.55		$204.10	
21.54	$231.59	21.43	$220.98	21.49	$225.59

These per-person rates, which include tax, are subject to change.

Greyhound patrons from the following cities shall merely add the round-trip to Chicago to complete the total cost.

Origin	Destination	Fare	Tax
New York City	Chicago and Return	$32.35	$4.85
Boston, Mass.	Chicago and Return	37.35	5.60
Rochester, N.Y.	Chicago and Return	22.60	3.39
Washington, D.C.	Chicago and Return	28.65	4.30
Philadelphia, Pa.	Chicago and Return	30.90	4.64
Cleveland, Ohio	Chicago and Return	13.05	1.96

Prices from Chicago include: 1 — Round-trip Greyhound Transportation as shown; 2 — Discharge and pick-up at hotels while on tour; 3 — Eleven hotel nights; 4 — Six meals at Utah Parks, seven meals at Yellowstone; 5 — Sightseeing tour at Grand Canyon — South Rim; 6 — Sightseeing tours at Utah Parks; 7 — Sightseeing tours at Yellowstone National Park.

Greyhound Transportation rates for a comparable trip from the following cities are:

Origin	Round-Trip Fare	Tax
New York City	$117.85	$17.68
Rochester	109.00	16.35
Washington, D.C.	112.90	16.94
Philadelphia, Pa.	115.75	17.36
Cleveland, Ohio	99.90	14.99
Chicago, Ill.	88.55	13.28
Boston, Mass.	122.55	18.38

These rates are transportation only and in all cases an additional $28.75 is to be added when utilizing Yellowstone Park Bus Service.

A great deal of flexibility in routings is available in the above quotations, hence, for those desiring transportation only, I strongly urge a visit to our excellent Travel Bureaus in each of the cities mentioned, for further counsel. For those who wish to participate in the tour plan from Chicago, all inquiries should be sent to Mr. J. A. Chapin, Manager of the Greyhound Travel Bureau, 105 West Madison Street, Chicago, Illinois. We shall process all arrangements through the mail.

Medical Photography in Great Britain

CHARLES LINDSAY*

PLANNING a visit to Glasgow, Scotland, last September, (my first since I left there in December, 1920), I considered it would be interesting to enquire into the situation regarding medical photography over there. Through the good services of Dr. Peter Hansell of London, England, and also as the result of a personal letter to the assistant superintendent of the Glasgow Royal Infirmary, one of Glasgow's leading hospitals, I was furnished with introductions to Mr. Spencer Breslin, A.I.B.P., A.R.P.S., of the Royal Cancer Hospital, Glasgow, President Scottish Center I.B.P., Convenor Scottish Medical Group I.B.P., and Mr. James L. P. Evatt, Royal Hospital for Sick Children, Glasgow, Publicity Officer, Scottish Medical Group, I.B.P.

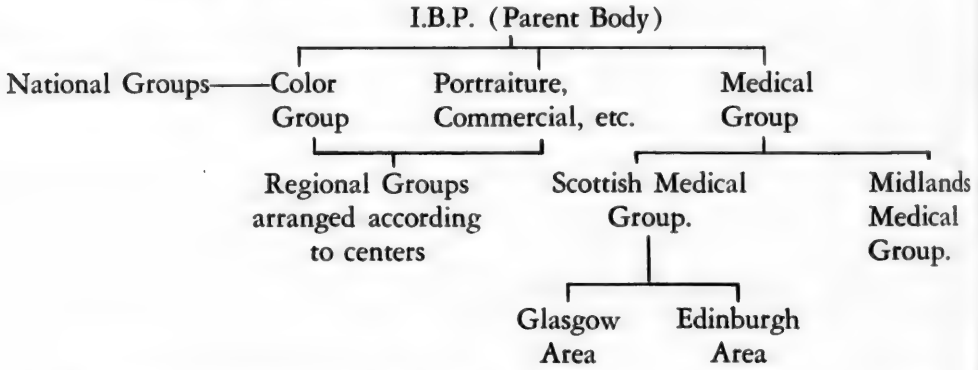
On arrival at Glasgow, I soon contacted both gentlemen and saw their departments. Like many of us in U.S. they could use more space, but they had, I would figure, about the average space we have here. Equipment was similar to what we usually find in a medical photographic department plus such equipment that has to be designed and specially built for specific purposes, and not available through regular channels.

* Photography Dept., Stritch School of Medicine of Loyola University, 706 S. Wolcott Ave., Chicago, Ill.
Received for publication November 26, 1951.

Mr. Breslin very kindly arranged a meeting of the Glasgow group at his office on the evening of Tuesday, September 25th, where we enjoyed three hours' informal discussion of medical photographic conditions on both sides of the Atlantic. Coming, as I did, straight from Boston, I was able to give them a report of proceedings there, and left with them a copy of the Convention program, some Eastman Kodak Co. and Ansco literature, and three back issues of the B.P.A. Journal kindly provided by Dr. Richards. Later, I mailed to Mr. Breslin a reprint of a paper by Mr. Leo Massopust on infra-red photography of the female breast.

From notes I took at this meeting, and from a very fully detailed letter I received from Mr. Evatt, in reply to one of mine asking for some more information after I returned home, I am able to give the following outline of medical photography in Britain. Because of the brevity of my visit, it is not complete, but will give a general picture of the situation over there.

The professional organization for medical photographers is a section of the Institute of British Photographers. I am indebted to Mr. Evatt for the following chart illustrating the "family tree" of the I.B.P. according to professions.



The Medical Register of the I.B.P. has been closed with 123 names except to those who pass the final examination for registered medical photographers. To become a registered medical photographer now, it is necessary to pass three examinations—a preliminary, intermediate, and final. The first two examinations are on general photography, and are taken with the other groups. The final examination consists of a little advanced general photography, but is mainly on the specialized group subject,—in this case medical photography. For examples of final examination papers see the article "Recognition of Ability" in the Journal of the Biological Photographic Association, Vol. 18, No. 4, Nov. 1950, Pages 168-174.

Training of medical photographers is on an apprenticeship basis at present, but the medical group are working on plans for classes in several centers.

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An Easy Method for Coloring Lantern Slides

ROY KORSON, M.D., and FRANCIS C. MALLORY*

ON the lantern slides of graphs, curves, charts, etc., which are used to illustrate lectures, actual numbers on the slides may occasionally be of importance. More often than not, however, the relative values are stressed. One is interested in showing that a certain bar is higher on a graph than another bar. At the same time bars are individualized by cross-hatching, filling in, etc. This can be done much more efficiently by coloring the bars. The eye immediately separates the different colors and easily perceives differences in height or width. Even those observers in the rear of an auditorium can tell relative values without seeing actual numbers.

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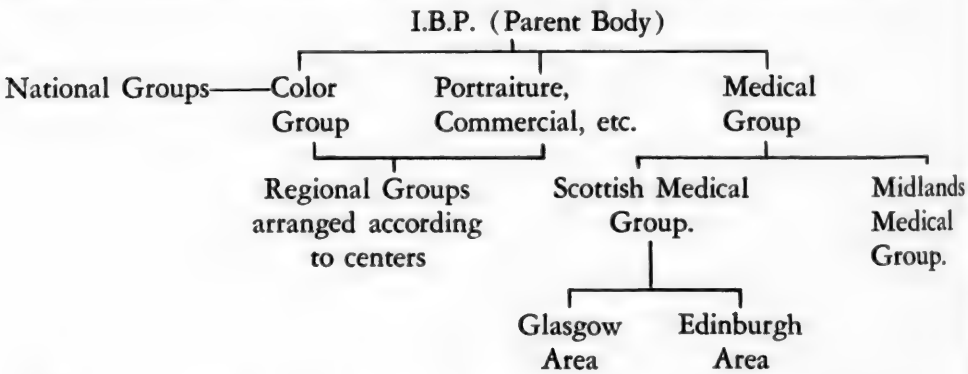
Once the strips have been cut, the lantern slide is turned over, so the emulsion side is up. The strips of colored gelatin are cemented into place, directly on the emulsion. For this purpose, any microscopic mounting medium is satisfactory. (We used Fischer Scientific Company's "Permount"). A small drop of the mounting medium is placed in the area to be colored and the gelatin strip is pressed into place, not with the fingers as this leaves a fingerprint, but with any smooth, flat object. Excess mounting medium will be squeezed out from under the gelatin strip. To remove this, a piece of lens paper such as that used for cleaning microscope lenses is laid over the surface of the slide and the lens paper is flooded with xylene. After a few seconds, the lens paper can be lifted up and all excess mounting medium will come with it. If any small deposits of medium remain, a camel's hair brush moistened with xylene will remove these readily. The slide is now covered and bound in the ordinary way.

* From the Departments of Pathology and Photography, University of Vermont College of Medicine, Burlington, Vt. Received for publication November 3, 1951.

Mr. Breslin very kindly arranged a meeting of the Glasgow group at his office on the evening of Tuesday, September 25th, where we enjoyed three hours' informal discussion of medical photographic conditions on both sides of the Atlantic. Coming, as I did, straight from Boston, I was able to give them a report of proceedings there, and left with them a copy of the Convention program, some Eastman Kodak Co. and Ansco literature, and three back issues of the B.P.A. Journal kindly provided by Dr. Richards. Later, I mailed to Mr. Breslin a reprint of a paper by Mr. Leo Massopust on infra-red photography of the female breast.

From notes I took at this meeting, and from a very fully detailed letter I received from Mr. Evatt, in reply to one of mine asking for some more information after I returned home, I am able to give the following outline of medical photography in Britain. Because of the brevity of my visit, it is not complete, but will give a general picture of the situation over there.

The professional organization for medical photographers is a section of the Institute of British Photographers. I am indebted to Mr. Evatt for the following chart illustrating the "family tree" of the I.B.P. according to professions.



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When projected the slide will be brilliantly colored with uniform, smooth dyes—and any writing will be just as clear as before.

The advantages of this technique are many:

1. Large charts or graphs do not have to be colored or cross-hatched by hand—saving considerable time.
2. Printing can be placed anywhere within the bars or curves.
3. Colored film is not employed, which means that no special processing is necessary, and again there is a considerable saving of time and money.
4. All the latitude inherent in black and white photography can be utilized in making the initial slides.
5. The colors are bright and uniform against a clear background, making the black and white slides more readable.

It might be added here that we did not use colored cellophane since we felt that it might wrinkle, whereas the gelatin sheets remained smooth throughout.

Announcements and New Products

Ansco has added a new surface to their "Indiatone" projection paper called Brilliant which gives a stippled, high sheen effect. The embossing into the paper is finer and deeper than that of their "Kashmir" and is stated suitable for enlargements of 4 x 5 or more.

Ansco announces three complete flash-camera-gadget bag outfits, containing their new "Readyflash camera", their "Rediflex" camera and their "Flash Clipper" camera. The outfits include the flash holder, bulbs, Supreme film, portrait attachment and gadget bags and sell for $15.95, $24.95 and $26.95, including tax.

Five new cameras are now imported and sold by *Ansco.* The "Karomat" is a 35 mm with f/2 hard coated lenses, synchronized Synchro Compur Rapid shutter for 1 second to 1/500, T and B. Range and viewfinders are combined and a rapid lever action is used to advance the film. $168.50, case $12.50. The "Speedex Special" is a folding 2¼ x 2¼ size with f/4.5 hard coated lens, Prontor S shutter 1 to 1/300 second, T and B. $49.95, case $6.95. The "Speedex" is similar with an f/4.5 lens and shutter speeds of 1/25, 1/50, 1/200, T and B. $37.50, case $6.95. The "Viking" is a conventional type folding camera with either an f/4.5 or a 6.3 lens, shutter speeds 1/25 to 1/200 and takes pictures of 2¼ x 3¼. $49.95, $36.00, case and filter holder $6.95 All prices include tax.

The U.S. Camera Achievement Award for outstanding contribution to the field of color photography was given to *Ansco* for the development of their "Color Printon."

Eastman Kodak Company reports a group of new "Data Books." "Professional printing with Kodak Photographic Papers" 50c. "Color separation and Masking" 56 pp. 50c. "Kodak Dye Transfer Process" 56 pp. 50c. "Kodak Films" 5th revised edition, 35c. "Kodak Chemical Preparations" 50c. This is a handbook for their prepared packages and the proper handling of them in storage, tanks, pipe lines, etc. The following sections from the "Color Handbook" are now sold separately: "Color as Seen and Photographed" 68 pp. $1.00. "Color Photography Outdoors" 56 pp. 50c. "Color Photography in the Studio" 64 pp. 50c. "Kodak Color Films" 60 pp. 50c. At Kodak stores and dealers. The Eastman Camera Club and School Service has a new sound motion picture

film "Magnifying Time" 16 mm, 15 minutes, showing various applications of their "Kodak High Speed" Camera. Available on loan to businesses, organizations and schools.

The *Kodak* "Matrix Film Punch" should aid color photographers to obtain registration with less trouble. The punching can be used with either their large or small register boards. $41.50.

Radically improved "*Kodak* X-Ray Processing Hangers" No. 3A have improved clips, new pin design, new clip shape, loupe guides and no increase in cost.

"*DuPont* Photographic Films" 83 pp. 35c, is the latest booklet received and is a delightfully brief manual of the fundamental aspects of photography as well as giving detailed information on their films and processing data.

A new surface "DS" has been added to *duPont's* "Varigam". It is a velvet grain, natural white, high luster in double weight; recommended for portraits and pictorial subjects. This is the tenth Varigam.

Film with a new polyester, synthetic base has been announced by the *duPont Photo Products Department* which has high dimensional stability and a lack of brittleness at low temperatures. It is related to their Dacron polyester fiber. A result of 5 years research, it is now being critically tested and should be available in quantities in about 2 years. W. Allen Taft formerly of the duPont Parlin plant is now assistant district manager of their Chicago Sales Office.

Director Products Inc., announce the "Rectaflex" and "Rectaflex Junior" 35 mm cameras imported from Italy. The Duo-Focus system is said to eliminate parallax and provide visual control of depth of field. The subject is shown without diffusion in the center of the ground glass and is bisected by a diagonal strip, within which any tilting of the subject indicates out of focus. F/1.5, 1.8, 2 and 2.9 lenses are available in bayonet mounts. Shutter speeds from 1 to 1/1000 second are synchronized for flash or strobe. $250 to $475. The Junior is similar in design, has lenses of f/2, 2.9, or 3.5 and shutter speeds to 1/500 second with synchronization for flash and strobe. $189.50 to $219.50.

A new "Twin Surface Print Dryer," Model 250 is offered at $17.95 by *Fedco Products,* New York City with each surface accommodating 4 8 x 10 prints (125 wts). A removable, washable canvas holds the prints on the plates to the drying surface.

Henry Roger, Sandy Hook, Conn. markets the "Ready-Eddy" which he devised to do most of the computing necessary for editing and use with motion pictures. It is a plastic disc with scales and cursor and it answers questions as to footage, projection time in minutes and seconds, number of frames per foot and per second and equivalents of 16 and 35 mm film. The data furnished are helpful to editors, music arrangers, animators, narrators, etc. $2.00, case 50c.

Suggestions for Contributors

Manuscripts should be sent to The Editor, Journal of the Biological Photographic Association, 70 Alton Road, Stamford, Conn.

Manuscripts must be typewritten, double or triple spaced, with full margins. The original and not a carbon copy should be submitted.

References: References may be given as footnotes or, if numerous, may follow the context. They should be given in the following forms:

Book—Valasek, J. 1949. *Introduction to theoretical and experimental optics.* John Wiley & Sons, N. Y. x+454 pp.

Journal Article—Carman, P. D. 1949. Photogrammetric errors from Camera lens decentering. J. Opt. Soc. Am. 39(11):951-954.

Tables: Tables should be typed on separate pages and should have captions which will explain the data without reference to the text.

Illustrations: Wherever possible illustrations should conform to the following proportions:

Horizontal—the quotient of the height divided by the width should equal 0.7.

Vertical —the quotient of the width divided by the height should equal 0.7.

Full page illustrations should not be less than 6.7 inches by 9.5 inches. Others should not be less than 4.25 inches by 6 inches.

When mounted, illustrations should be twice or three times the page width which is 29 picas, or 4-5/6 inches. Illustrations for the cover should be multiple of 39 picas, or 6.5 inches.

Legends should be typed on a separate sheet and keyed for identification.

Editorial Policy: The Editor will endeavor to cooperate with the author by following suggestions regarding layout where it is feasible. The cost of publication may make it necessary to revise the text and group illustrations. The author will be advised of any extensive changes.

The Editor and the Editorial Board reserve the right to reject any material which proves to be too expensive and/or which they believe to be unsuitable for publication in the Journal.

CONTENTS

Green, W. H. The Preparation of Prints for Publication ---- 3

Book Review: Photo Words in Four Languages ---- 13

Weinberg, S. A., Watson, J. S. Jr., and G. H. Ramsey. Cinefluorography at the University of Rochester School of Medicine and Dentistry ---- 14

Lantern Slides ---- 20

Johnstone, G. R. How to Show Exact Magnification in Photomicrography, Photoprojection and Publications ---- 21

Markham, M. Copying Microfilms ---- 24

Compulsory Movies of Surgery Advocated ---- 27

Hansell, P. Trends in Medical Illustration ---- 28

Book Review: Fundamentals of Optics by Jenkins and White ---- 32

Association News ---- 33

Chapter News ---- 33

Effect of Photoflash on Vision ---- 35

Letter to the Editor ---- 36

Tuttle, H. B. How to Get to Los Angeles in 1953 ---- 37

Lindsay, C. Medical Photography in Great Britain ---- 41

Book Review: Botanical Microtechnique by Sass ---- 44

Korson, R., and F. C. Mallory. An Easy Method for Coloring Lantern Slides ---- 45

Announcements and New Products ---- 46

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22nd ANNUAL MEETING

of the

BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

HOTEL NEW YORKER

NEW YORK CITY

September 10-11-12, 1952

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Commercial Exhibits

EUGENE OSTROFF
Department of Photography
Manhattan Eye, Ear, and Throat Hospital
210 East 64th St.
New York 21, N.Y.

The organization of the 22nd Annual Meeting is practically complete as of this date. Plans have been made by the Committee from the New York Chapter for a particularly vital and interesting program. As the Chapter of the B.P.A. with the largest membership, we expect a record attendance, both of in-town and out-of-town members. A Publicity Committee has started work, and will see that we get wide press coverage.

The "Call for Papers" has gone out to members. Already we know that the following subjects will be discussed by experts in the respective fields: Three-dimensional Motion Pictures, Latest Methods in Photographic Reproduction, Characteristics of Color Films, High-Speed Photography, Graphic Arts in Scientific Presentations, The Eye as a Camera Lens, Magnetic Recording on Film.

We are continuing the plan of holding group demonstrations of actual technics, which have been so popular in recent years. Photomicrographic Methods —a subject for which there is always a demand— will be shown. It is planned to set up a specimen darkroom in which members may watch up-to-date methods used in making black-and-white prints. Technics in Retouching Color Prints and Transparencies will be illustrated, and a fourth demonstration will be on Methods in Preparing Charts, Titles, and Simple Animated Diagrams for Motion Pictures.

Eminent speakers have already accepted for the Luncheon on September 10 and the Annual Banquet on September 12.

Members are urged to start working now on prints to be submitted to the Salon. Entry Blanks for these and for motion pictuers will be mailed out in June.

Plan to come, and stay on to enjoy the variety of attractions which New York City offers. The Hotel Management will appreciate your returning the registration cards as soon as possible after you receive them.

THE NEW YORK COMMITTEE FOR THE 22nd ANNUAL MEETING

Photomicrography of Constant Registry Autoradiograms*

PAUL N. WILKINSON, FRANK E. HOECKER, and PAUL G. ROOFE**

IN the course of an investigation of the deposition of radium salts in bone by means of an autoradiographic technique, the problem of recording and utilizing this material presented itself. The necessity of maintaining absolute registry between the tissue sections and the nuclear track plates posed many problems which made ordinary equipment and procedures impracticable. Although the method to be presented represents a specific solution to a specific problem, it is flexible enough to permit application to any study involving tissue localization of radio-isotopes at a microscopic level.

In addition to the primary consideration of registry, there are two other problems which must be taken into account. These are, (1) contrast and (2) fidelity of reproduction. In considering the first of these, contrast, it should be pointed out that alpha track autoradiograms are essentially fine black lines of varying length, orientation and degree of opaqueness. On the other hand, the tissue, bone, exhibits a continuous graduation of tones and a multitude of fine structural detail. Any method to succeed routinely must, of necessity, resolve this dilemma of continuous tone and line reproduction.

The second problem, fidelity of reproduction, is related to the first. As has been previously pointed out, this photomicrographic method was developed as a research technique, namely, to permit a more rapid and accurate evaluation of tissue damage resulting from localized concentrations of radium salts. Therefore, the latitude normally allowed in reproduction must be reduced carefully to a point where the final print is an accurate and faithful representation of the original subject.

The constant registry autoradiogram[1,3] differs considerably from other types in that the tissue is mounted upon a flexible plastic cover slip and is secured to a nuclear track plate at one end by means of a special cement. This arrangement permits the elevation of the tissue section in subsequent processing of the plate, yet facilitates its restoration to the exact position of exposure. It is this feature of the autoradiogram, the flexible cover slip, that makes it possible to photograph the tissue and the track plate separately and, as a result of a simple device

* This work was sponsored jointly by the Office of Naval Research under Contract No. N6 onr 260, T. O. 1, and by the U. S. Atomic Energy Commission under Contract AT(11-1)-83.

** Departments of Physics and Anatomy, University of Kansas, Lawrence. Presented at the 21st Annual Meeting. Received for publication September 13, 1951.

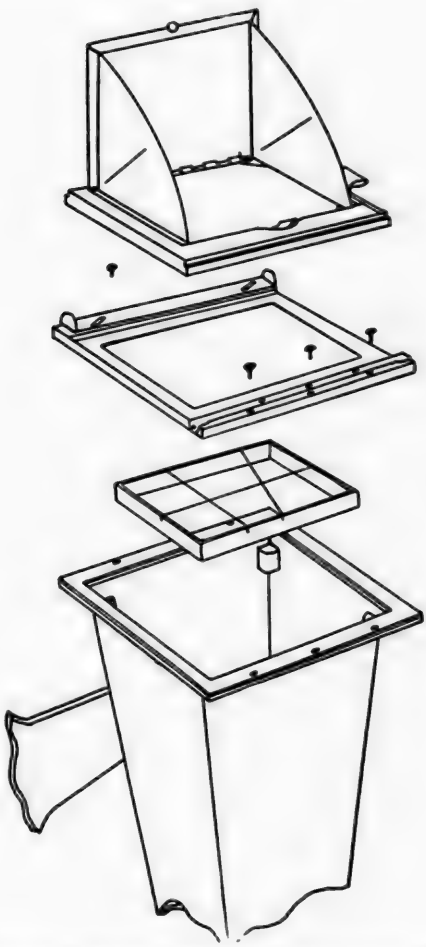

Figure 1. Exploded view diagram showing necessary modifications of the camera back and the positioning of the wire grid.

installed in the film plane of the camera, to produce two prints capable of being compared with a very small dimensional error.

The photomicrographic camera selected for our purpose was a Bausch and Lomb Type K, with a negative size of 3¼″ x 4¼″. This particular model was chosen in preference to a more flexible type because of its fixed bellows extension. The Alphax shutter normally supplied with this equipment was removed. A Rapax #2 was substituted in its place for increased ruggedness, greater exposure range and the added convenience of the press-focus feature of this shutter.

A grid consisting of fine longitudinal, transverse, and diagonal wires mounted on a light balsa-wood frame was placed in the camera back. Four small blocks

were cemented to the corners of the metal bellows to support the grid just below the film holder. Sufficient clearance was allowed to permit ready removal and replacement of the film holder without disturbance of the grid. The supporting blocks and grid frame were painted flat black to prevent light reflection.

The purpose of this device is to record on the film at the instant of exposure registry marks which are permanently fixed relative to the autoradiogram and at the same time are independent of the orientation of the sheet film in the holder. It might be pointed out in passing that the diagonal line recorded on the negative serves in the additional capacity of preventing accidental reversal in printing. If this should occur it may be detected at once and prevent possible misinterpretation of results.

The microscope found to be most readily adaptable was the Spencer Research Type 5LRK. It has an exceptionally heavy stand which is indispensible for good mechanical stability and an accurately calibrated mechanical stage which holds its alignment well. The optics selected were apochromatic objectives with corresponding compensating eyepieces and an achromatic condenser in a centerable mounting. Due to the increased thickness of the glass support of the nuclear emulsions, it was found necessary to use an auxiliary lens with the condenser to secure proper illumination of the field at low power by raising the focal point. The monocular body supplied with this microscope, however, had one small disadvantage which was easily remedied. It had an adjustable draw tube and it was necessary to make a small collar which slipped down over the movable portion to hold the tube length at 160 mm.

Illumination was provided by Spencer #370 lamp using a 100 watt, 120 volt spiral filament bulb. Line voltage fluctuations were reduced to a minimum by means of a small Sola constant voltage transformer. A modified Köhler alignment system was used which will be described more fully later.

There is one additional item of equipment that should be mentioned at this time. It was found that a fixed print size, namely 8″ x 10″, was best suited for study and record purposes. Also, the final image size, of necessity, had to be readily reproducible within very narrow tolerance limits. Accordingly, the "4-Way" easel manufactured by Airequipt was found to best satisfy these requirements in preference to the usual adjustable type. To facilitate final dimensioning, a series of fine lines were scribed into the metal margins of the easel cover. These guide lines were made to correspond exactly with the pattern formed by the camera grid on the negative. They were filled with white enamel to render them more readily visible in the dark room. Both sets of line were made to coincide by careful focusing of the negative in the printing process. Subsequent measurements have demonstrated the final dimensional error to be less than

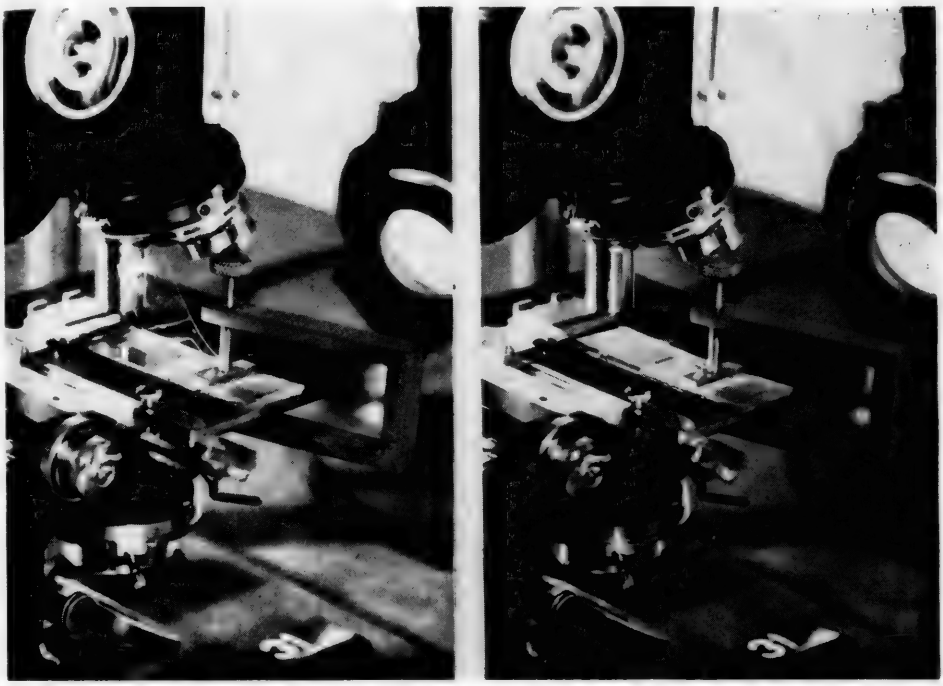

Figure 2. Autoradiogram positions before exposure. Left Cover slip raised and the microscope focused on the nuclear track plate. Right Cover slip returned to registry and the microscope focused on the tissue section. Note the special clamp used to lock the transverse motion of the mechanical stage.

0.1%. The limiting factors were found to be film shrinkage and paper moisture content.

After considerable experimentation with various emulsions, it was found that Kodak Contrast Process Ortho best fitted the conditions of this method. It is a slow speed, high contrast, orthochromatic emulsion with a maximum resolving power of 125 lines to the millimeter. It was found that the contrast could be satisfactorily controlled by over exposure of the tissue negative and under development in diluted developer. Normal exposure and development produced the desired high contrast in the track negatives. Careful control of the temperature produced negatives free from objectionable grain.

Optical alignment was carried out in the usual routine manner and differed only slightly from the procedure outlined by Shillaber[4]. Köhler illumination[2] was used as a basic lighting arrangement, modified by the addition of a diffusion glass in the lamp and the previously mentioned auxiliary lens placed below the condenser diaphragm.

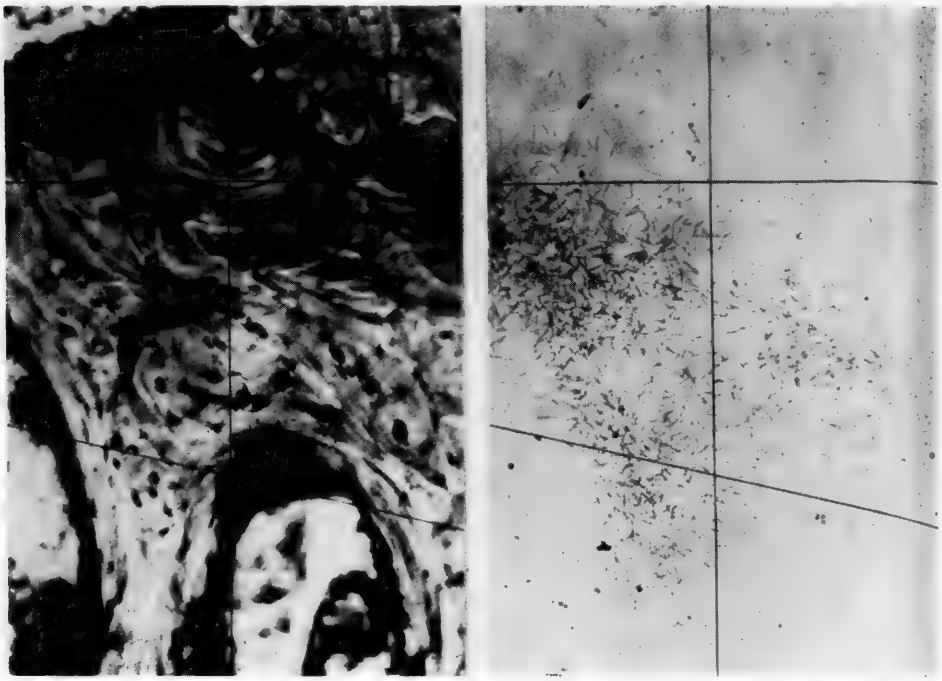

Figure 3. Low power photomicrographs. Left Undecalcified section of adult human ischial tuberosity. Thickness, 30 micra. Right Alpha track pattern formed by localized deposit of radium salts. Autoradiographic exposure, 400 hours. Distance between grid intersections, 340 micra.

Exposure calibration was accomplished by placing an autoradiogram on the stage and making a series of trial exposures at intervals of one-half second, first of the bone section and again of the track plate. This process was repeated for each combination of objective and eyepiece. Prior to exposure, the light intensity was measured at a point approximately 3.5 centimeters above the eyepiece with a Weston meter. After development, the negatives were examined and the step with the correct exposure was selected. Since the bone sections were of relatively uniform thickness and the lighting set-up a constant value for any given lens combination, the meter reading was used as a basis for exposure. Minor variations were compensated for in development.

Overall dimensional calibration of the equipment was done by photographing a Zeiss stage micrometer and printing the negative obtained with the guide lines in registry with those on the easel. It was necessary to repeat this procedure for each lens combination. By measuring the distance between the points of intersection of the grid with a centimeter scale, it was possible to determine the size of any structure on the print directly in microns.

The procedure followed in photographing the autoradiograms was similar

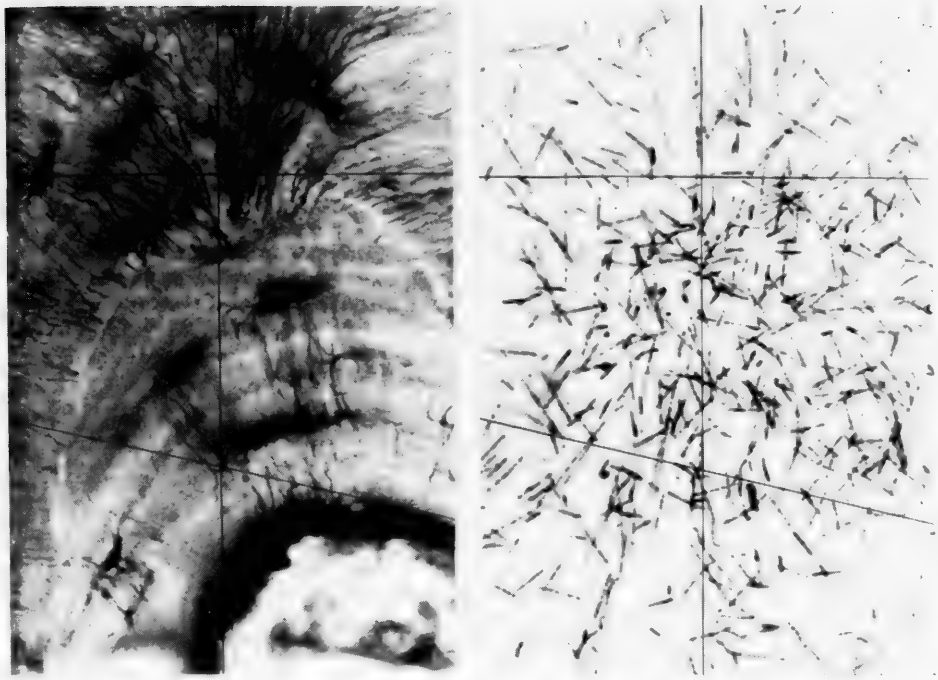

Figure 4. **Medium magnification photomicrographs. Left** Section of Ischial Tuberosity exhibiting a reversal line. **Right** Alpha track pattern formed by a 400 hour exposure. Distance between intersections of the grid, 76 micra. Note the precise conformity of the radioactive deposit to bone structure.

to that used in the calibration of the equipment. The autoradiogram and its attached cover slip were placed on the mechanical stage of the microscope. The cover slip was elevated and that area on the nuclear plate corresponding to the bone section was carefully searched. When an area exhibiting localized concentrations of alpha tracks was found, the slide was clamped on one end and the stage was locked securely to the frame of microscope. Focusing was done exclusively with the ground glass as the beam splitter supplied with the camera was found to be unreliable. The alpha tracks were then photographed, the bone section was lowered into registry and the corresponding area of the bone was photographed. Exposure was made on the basis of the light meter reading obtained in each case and reference to the calibration of the lens combination used.

The exposed films were loaded into film hangers and were developed by inspection in Kodak D-19 diluted 2:1. The temperature was held constant at 68° F. This method of development is admittedly more time consuming and inconvenient than tank processing by time and temperature. However, earlier

experience had demonstrated quality and not quantity to be the more important factor in time and economy. To facilitate better density control, all alpha track negatives were processed in one group and all tissue negatives in another group. The tissue negatives were developed to a point where the high lights exhibited a very slight darkening. On the other hand, the track negatives were permitted to develop to a point where the blackening of the background was clearly visible on the reverse side of the film when viewed under the safe light. This was found to produce a thin, highly detailed negative of the tissue that was easily printed on a normal grade of paper and a dense sharply defined line copy negative of the tracks.

The negatives were printed in a 4″ x 5″ Kodak Precision enlarger using the special easel, previously described, for maintenance of scale. Dupont Varigam paper and Varigam filters were used and the development was done in Kodak D-19 diluted 2:1. After processing, the prints were treated in 10% propylene glycol before ferrotyping to reduce the tendency to curl and to stabilize the moisture content.

A slight modification of the printing method has proven useful for certain applications. The negative of the tissue was printed as usual on paper. The nuclear tracks, however, were printed on 8″ x 10″ sheet film to produce a transparent overlay. This was placed over the tissue photo to form a composite. The composite was found to be extremely useful in associating the structural features of the tissue with radioactive deposition sites. Of the several emulsions that were tried, Kodak Contrast Process Pan has produced the best results due to its low speed. Ordinarily, the cost would have been prohibitive, but war surplus film was easily obtained at a very reasonable figure.

Summary

A method has been presented whereby it was possible to produce two separate negatives of a constant registry autoradiogram. By means of a wire grid installed in the camera and use of a special easel, it was possible to compare the prints made from these two negatives with a high degree of accuracy. Details were given for the necessary modification of standard equipment. The principal problems encountered in the operation of this equipment and their possible solutions were presented. The method of illumination, optical alignment, exposure calibration and the determination of magnification factors were discussed and the maintenance of a fixed magnification ratio emphasized.

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Paper Negatives as an Aid in Selecting Fields in Photomicrography *

FRED H. MEILLER**

Introduction

HAVING photomicrographs made is a time consuming procedure for the investigator. A method is described whereby photomicrographs of histological preparations can be made without requiring the presence of the investigator in the photolaboratory to locate or select the areas to be photographed. The method may also be useful if the investigator is at a distance from the photolaboratory, since it readily lends itself to mail or messenger service.

Description of Method

A. Preliminary paper negative

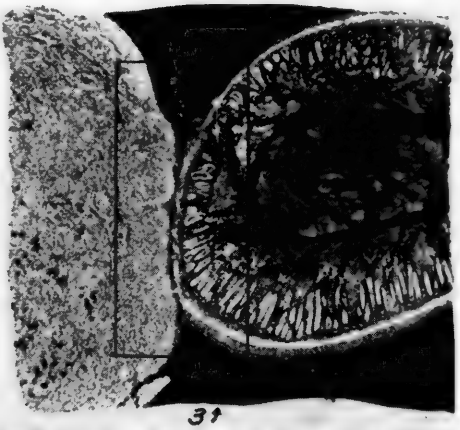
The investigator marks a field that includes the area he wants to have photographed by drawing a circle with crayon or India Ink, figure 1, on the cover glass of the slide. This marked slide is then photographed on inexpensive photostat paper using a micro-tessar lens at a magnification of from 20 to 80 diameters. When the marked area of the slide is visualized on the ground glass of the camera, the ink or crayon marks should be plainly visible around the edge of the picture, to assure positive identification of the area.

While exposure factors for individual photomicrographic equipment vary considerably, the following factors may serve as a guide. It has been found that Dupont Photowrit paper has approximately the same speed as Kodak Panatomic X film when used in conjunction with the green Wratten filter B number 58; Weston reading 25 taken at the eyepoint of the microscope;—bellows draw—100 cm.; objective 16mm tessar and 16mm condenser; magnification—60×; exposure time from 1/10 to 2/5 seconds, depending on the section.

The paper negative is developed in D-72, 1:1. The resulting image should show all the details of the section clearly against a dense black background, figure 2. The paper negatives are fixed, washed and dried in the usual manner.

* Presented at the 1951 Annual Meeting. Received for publication October 12, 1951.

** Laboratory of Pathology, National Cancer Institute of the National Institutes of Health, Public Health Service, Federal Security Agency, Bethesda 14, Maryland.



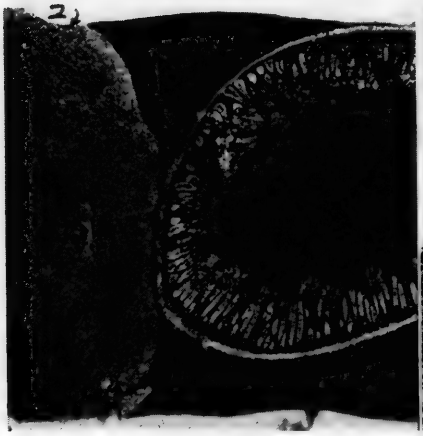


Figure 1. Marked slide, ¾×.
Figure 2. Paper negative, 15×.
Figure 3. Marked paper negative.
Figure 4. Final photomicrograph, 45×.

B. Marking of the desired area on the paper negative

The paper negatives and the histological preparations are returned to the investigator for final marking.

The specific area the investigator wishes to demonstrate is marked off on the paper negative with pencil or ink. This automatically designates the desired magnification and assures that the desired area is adequately covered, figure 3. The marked paper negatives and the histological preparations are returned to the photolaboratory. Since the area to be reproduced is indicated on the paper negative, the photographer can readily determine the final magnification. The projected image of the section is viewed on the ground glass of the camera and the paper negative serves as a guide in locating the exact field which is to appear on the

final print. As soon as the proper field has been located the photomicrograph is taken in the usual manner, figure 4.

Summary

A method is described for precisely delineating areas of histological preparations to be photographed. While the method is most easily employed when relatively low magnifications are required, satisfactory photomicrographs have been obtained up to a magnification of 950×. A preliminary print is made on photostat paper, on which the investigator marks off the desired area to be photographed at higher magnification. The final photograph can then be taken in his absence.

Book Review

Insect Natural History. **By A. D. Imms, Cambridge University. Published by The Blakiston Company, Philadelphia, Pennsylvania; 1951. 317 pages, 32 illustrations, 40 color plates, 50 figures. Price, $5.00.**

One of the attributes of a nature photographer is his interest in Nature. This interest may be avocational or professional, depending on the photographic activity, but it has to be strong if the photography is to be successful. This book is invaluable for the insect photographer because it stimulates an interest in land and water insects in addition to providing a reference.

The American photographer who picks up the book in expectation and then drops it because he notes that it presumably deals with British insects, should pick it up again — for two reasons. First, he should notice that the title is general: Insect, Natural History; Second, there is a considerable overlapping, especially at the genus level, of insect habitats in Great Britain and North America.

Probably, the greatest value of the volume is the concise completeness with which it covers the basic biology of insects. This is coupled with an easily-read, yet authentic, style. Those who have never before studied entomology can proceed to do so here without the slightest difficulty. Those who have done so will not get the feeling that the text has been written down. The author's knowledge and enthusiasm in his subject and his familiarity with famous entomologists and, what may be termed "insect lore", sustains readability for even those with only a mild interest in entomology.

Insect structures and life histories are first dealt with so that an understanding of classification can be prepared for. Revealing chapters on the intricacies of flight and sensory mechanisms follow. Habitats and social and feeding habits are discussed and such details provide information useful in finding and identi-

fying specific photographic subjects. Protective devices are presented and their "failures" are implied in the treatment of biological control. The latter chapter is the most specific one on economic entomology. A chapter on galls offers a field of photographic endeavor that alone could occupy complete photographic interest.

There is no data on insect photography as such. Nevertheless, the example set by the numerous illustrations will be of great assistance to those who want to know *how* to photograph these subjects. And the book is replete with descriptions of key detail that would have to be shown photographically to depict the insects significantly. Intellectual as well as entomological honesty has been maintained by indicating when anesthetized or dead specimens appear, which is only rarely. One cannot leave the illustrations without admiring the beauty and technical excellence of the color plates.

Those who want to know *what* to photograph in the insect world, will find more story ideas than he could cover in a lifetime. The natural history of insects is such an intriguing field that no enthusiastic Nature photographer can fail to begin planning a project long before he has finished reading the book. — H.L.G.

Report on the Fifth Congress of the International Scientific Film Association*

This congress took place at the Hague, Holland from September 14 to September 23, 1951.

The Royal Dutch Shell Group and the Dutch Ministry of Information were responsible for the finances . . . the organization of the congress and the hospitality offered to delegates was really quite remarkable.

All meetings of the General Assembly and of the Medical Committee were held in the Municipal Museum.

Meetings of the General Assembly were devoted in the main to receiving reports of work done by member countries and reports and recommendations from the committees. English and French were used as the official languages, and an interpreter from Geneva was available at all official meetings.

J. Maddison (Great Britain) was re-elected President
C. Sylvester (Great Britain) was re-elected Member of Council
Dr. R. C. MacKeith (Great Britain) } were re-elected joint secretaries
Dr. M. Donaldson (Great Britain) } at the Medical Committee.

* Received November 27, 1951 from C. E. Engle, Medical and Biological Illustration, London.

Twenty delegates from Great Britain were amongst a total of 84 delegates from:

The United States, Belgium, Germany, Great Britain, France, Israel, Italy, Mexico, New Zealand, Austria, Uruguay, Switzerland, and U.N.E.S.C.O.

The Medical Committee included the following delegates from Great Britain:

Dr. Donaldson, Mr. Engel, Dr. MacKeith, Mr. Moreman, Dr. Russell Reynolds, and Dr. Stanford.

The following British Medical Films were shown of a total of thirty films:

A case of Cerebellar Atoxia	— St. Mary's Hospital
Bacteriological Techniques	— St. Mary's Hospital
Bathing a Sick Baby	— Guy's Hospital
Cineradiography	— Dr. Russell Reynolds
Development of Manipulation	— Sheffield United Hospitals
Functions of Carotid Sinus and Aortic Nerve	— I.C.I.
Life Cycle of the Malaria Parasite	— Gaumont British Instructional
Sialographic Techniques	— Dr. Stanford
Some Aspects of Accessible Cancer, the Skin	— C.O.I.
Some Aspects of Muscle Relaxants	— Welcome Foundations

The general impression gained from all the medical films shown was that little thought was given to the following consideration:

1. What is to be taught, explained or demonstrated. 2. To whom. 3. What is the best means of doing so. 4. The film having been chosen as the best medium, how should it be made. 5. The film having been made, how can one determine whether it does in fact, achieve what it sets out to do.

Most individual film makers appear to start with the handling of a cine camera and to finish by regarding the unedited result as the final film.

In this respect, by contrast, the British, Belgian and German films stand out as planned and better executed. The German and Belgian films however are more concerned with recording research techniques and research results, while the British films seem to concentrate more on education and instruction.

Technically British films can learn from American productions. The latter however were all made by large units specializing in film making. One American film was particularly outstanding in its aims, planning and execution: "Embryology of the Human Eye". The medical advisor, Professor Smelser, is now in this country, temporarily attached to the American Embassy. It is hoped that a special showing of the film can be arranged at the Institute of Ophthalmology, as the sponsors are looking for criticism from teaching Anatomists and Ophthalmologists in this country before deciding to make any further films.

Contact was made with the few institutes, hospitals or university departments which make films on a planned basis:

MR. W. T. BETTS:	Audio visual production division, Communicable Disease Center U.S. Public Health Service
MR. J. L. FREDERIC:	University of Liege
DR. R. POLLART:	University of Brussels
DR. K. G. ADRIAN:	Director of "Film in Wissenschaft Und Technik" Western Germany
DR. WOLF:	Director of the Department of Technical Training and Research The Institute of Illustration in Education and Science Gőttingen, Germany
M. J. PAINLEVE:	Director of the Institute for Scientific Cinematography
PROF. M. PONZO:	Director of the Centre for Scientific Film Investigation under the National Research Council, at the Institute of Psychology, Rome
DR. W. DE VOGEL:	Director of the University Film Unit at Utrecht
PROF. W. MARINELLI:	University of Vienna
PROF. R. V. TALICE:	University of Monte Video

Most of the Medical Committee's time was taken up by viewing films. One session was held in conjunction with the Research Committee. Three meetings were devoted to the future programme of the committee.

1.) Further international catalogues of specialist films are to be made. After the revision of the second edition of the list of films on Parasitology, further list are to be compiled on Anatomy and Gynaecology.

2.) Further films are to be made through the co-operation of several countries.

3.) A central medical film library, where films from all member countries can be viewed was temporarily abandoned. The library of the International Body is to act as a reference and information center. In the meantime a working party is to compile data on the collection and distribution facilities in the various countries. It may then be possible to establish specialist libraries on given subjects in those places where a nucleus of such films may already exist.

4.) The appraisal of films was referred to the Appraisals Committee for the establishment of an international procedure on the lines of the system already employed by the Scientific Film Association in this country.

3.) The question of copyright was referred back to the council of the international body, in collaboration with the Research Committee.

Though most of the time was occupied by viewing films and by establishing machinery for the better functioning of the international association, very instructive contacts were made. It is hoped that future congresses will formulate more concrete aims and that the association will help to point the goal, towards which the making of scientific films and their uses should progress.

A Portable and Versatile Unit for Photomicrography and Microcinematography

MERVIN W. LaRUE, SR.*

MUCH of the progress of medical science has been dependent upon the microscope, so it is not surprising that photomicrography has been an important method of illustrating scientific papers and lectures for many decades.

As the motion picture developed, men of science were engaged in many and various attempts to utilize this new tool in their work. Even with the heavy, bulky and cumbersome motion picture cameras then available, many workers had considerable success in harnessing them to the microscope.

In spite of the weight and size of the cumbersome 35mm. motion picture cameras, they were mounted above the microscope eyepiece in such a position that the film aperture could receive the verticle image projected by the eyepiece—or the microscope was utilized in its horizontal position to permit the camera to be used in its normal position. This resulted in a lower center of gravity and permitted the mounting of both microscope and camera on a modified optical bench, or lathe bed. However it introduced many other problems, especially in the efficient operation of the microscope. Beam-splitting prisms were introduced primarily for viewing only because of the light loss inherent in the inefficient reflective coatings then available. Vibration was a serious problem in either case and many elaborate and costly installations were confined to the basement where they were mounted, or suspended, on I beams embedded in concrete to secure a solid foundation.

The introduction of 16mm. cameras and film made it possible to simplify these methods and several manufacturers developed, or adapted, apparatus and accessories to permit the use of the smaller, lighter and more economical units. In designing these modifications, however, most manufacturers followed the trend already established, so the same problems were ever present although to a lesser degree. Even though camera and microscope were in some instances mounted on separate supports and cushioned with rubber, vibration remained a serious handicap. The most perfectly operating motion picture camera vibrates to some extent, and if mounted separately will "bounce" when the microscope does not, so the result is discouraging, especially if operating speeds are above normal and at the higher magnifications.

President, Mervin W. LaRue, Inc., Medical Motion Pictures and Illustration, 159 East Chicago Avenue, Chicago 11, Illinois. Received for publication Aug. 18, 1951.

About twelve years ago—in connection with our work—the need for an efficient and versatile unit became acute. We could find nothing on the market to meet the necessary requirements and the many installations examined left much to be desired. Therefore, the writer determined to start from scratch and develop a unit which would meet all possible anticipated requirements. The desired specifications were carefully listed as follows:

1. One unit for both motion and still pictures.
2. Microscope, light source and cameras all rigidly mounted on the same foundation, which could in turn be mounted on springs or rubber, so that all vibrated as one unit.
3. Not "movable" or "toteable" but *portable*—light in weight and demountable, so as to be easily transported, in suitable cases, by automobile.
4. Easily and quickly assembled for use anywhere a solid desk or table could be made available.
5. Constructed so as to permit operation in lighted room.
6. Constructed so as to permit use of any standard microscope in its normal operating position.
7. Constructed so as to permit use of any light source in its normal operating position.
8. Constructed so as to permit use of any 16mm. motion camera or any type of "still" camera.
9. Constructed so as to permit the viewing of the subject continuously during exposure.

A careful study of Figure 1 will indicate how well we have met the specifications listed above. Several such units have been constructed, each one in turn slightly modified and an improvement upon its predecessor.

It was found that the optical system diagramed in Figure 2 offered the greatest possibilities for the following reasons:

a. Permitted design of the apparatus with a low center of gravity.
b. Permitted the installation of a beam-splitter cube in the nose piece of the microscope without impairing its use or flexibility in any way.
c. Permitted the use of compensating eyepieces, so as to correct aberrations and simplify operation.

The split-beam cube and housing represent the heart of the unit. Two one-half inch right angle prisms form the cube. The hypothenuse of the lower right angle prism is aluminized to reflect approximately 80% of the light passing through the objective and the upper prism is cemented to this with a plastic cement

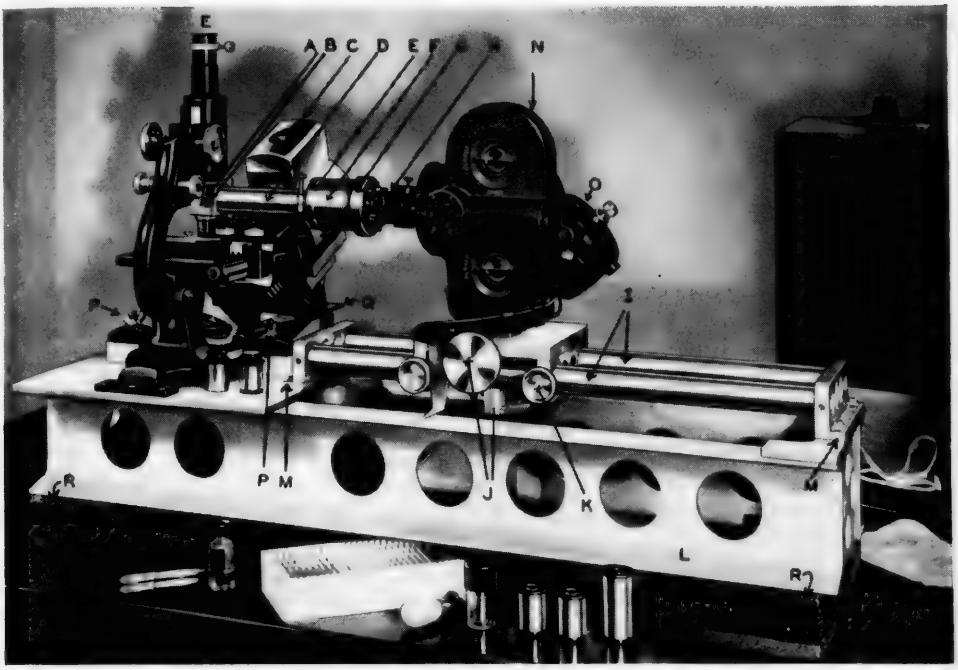


Figure 1. General View—Setup for Microcinematography

A, Beam-splitter cube—mounted in B, Prism housing—replaces nosepiece on microscope; C, Lamphouse—support accommodates any type; D, Extension tube—same focal length microscope tube; E, Compensating eyepieces; F, Male portion of light trap; G, Female portion of light trap; H, Reflex focuser—a convenience but not essential; I, Hollow steel rods; J, Adjustment for height; K, Locks—to lock camera in focal position; L, Aluminum alloy channels; M, Adjustment for alignment; N, Camera—without lens; O, Motor drive; P, Base clamps for microscope; Q. Support for light source—integral part of channel base; R, Sponge rubber pads.

having the same index of refraction as the optical glass. The back and sides of the cube are ground and blackened to prevent internal reflections and the polished surfaces can be coated if desired.

The prism housing—which takes the place of the nosepiece on the microscope—must be machined to close tolerances, yet is constructed in such a manner that the reflecting cube can easily be removed for cleaning and quickly replaced.

An extension tube, having the same identical length as the microscope body tube, extends at right angles and accommodates the photo eyepiece. Over this is the movable portion of the light trap which fits the tube as a sliding sleeve. The opposing part of the light trap fits any "C" mount lens opening, and when the light trap is in position it forms a light-tight path from the microscope to the camera.

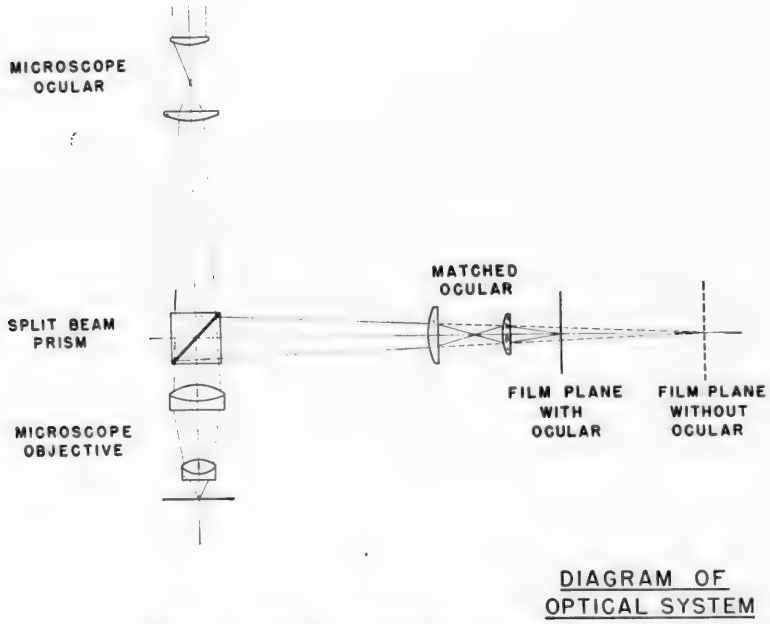


Figure 2. Diagram of Optical System Employed

The base is constructed of aluminum alloy channels and the bench rods are of hollow steel and mounted in adjustable blocks for initial alignment. The microscope hold-down blocks are of bakelite or lucite, and an extension channel extends from the back with threaded holes or clamps to support the various light sources used. This channel rod is removable for transportation of the equipment from place to place. The camera support is adjustable in height to accommodate the various types of cameras used and the various objectives employed. Any conventional type microscope can be employed, the nosepiece being replaced with the beam-splitter housing.

On location it is a simple matter to set up the apparatus in a convenient place for operation. This is usually a laboratory table or sturdy desk top in or adjacent to the clinic or laboratory. The "optical bench" is placed on the table and the channel rod for supporting the light source is attached and locked into place thus becoming an integral part of the unit. Sponge rubber pads are placed under the bench at five supporting points. The microscope is fixed in its jig and locked into position. The extension tube from the split-beam housing is screwed into position and the male end of the light trap attached. The camera is then mounted in place with a conventional tripod screw and pins. The reflex focuser device is screwed into position taking the place of the camera lens. The female portion of the light trap is then attached to the end of the reflex

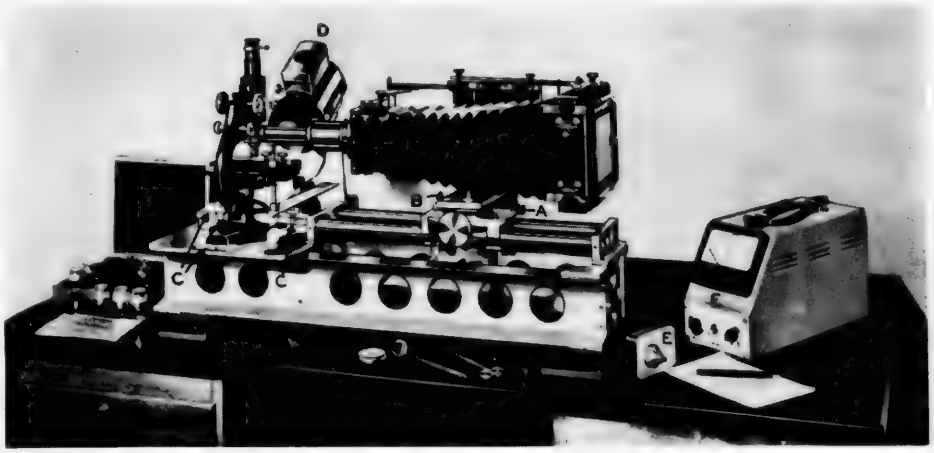


Figure 3. General View—Setup for Photomicrography

This is present unit, A, Improved locking device; B, Right angle support to accommodate any type of still camera; C, Jig guides and hold down clamps of lucite. E, Density, or exposure readings taken with Densichron.

focuser in a similar manner. The light source is mounted and centered in the usual manner. The compensating eyepieces are matched as to focus using a slide selected for this purpose—the camera being moved along the rods to the extreme right position to permit inspection through the eyepiece. This is accomplished by placing a 10% to 25% transmission neutral density filter in the light path, or by projection at the film plane. The light beam is so intense that the unprotected eye might suffer damage.

The use of the reflex focuser increases the magnification to some extent because of the lengthened optical path. Its use is desirable because it permits a constant check on the image reaching the aperture and is a convenient point for taking density or exposure readings with the densitometer probe. If the magnification must be exact with that viewed through the top eyepiece, the reflex focuser is dispensed with and focusing accomplished with a prism in the aperture of the camera. The Eastman Cine Special, the Bell and Howell Specialist and some other motion picture cameras are designed to permit focusing through the lens at the film plane.

While the majority of light sources have been employed from time to time the writer has found that the 6-V 18 amp ribbon-filament lamp operating at 8 to 8½ volts during exposure is most suitable for the majority of motion picture work. For convenience, the writer had a modified Spencer lamphouse constructed which produces greater efficiency with the ribbon-filament lamps operated at higher voltages and which permits the use of several other lamps

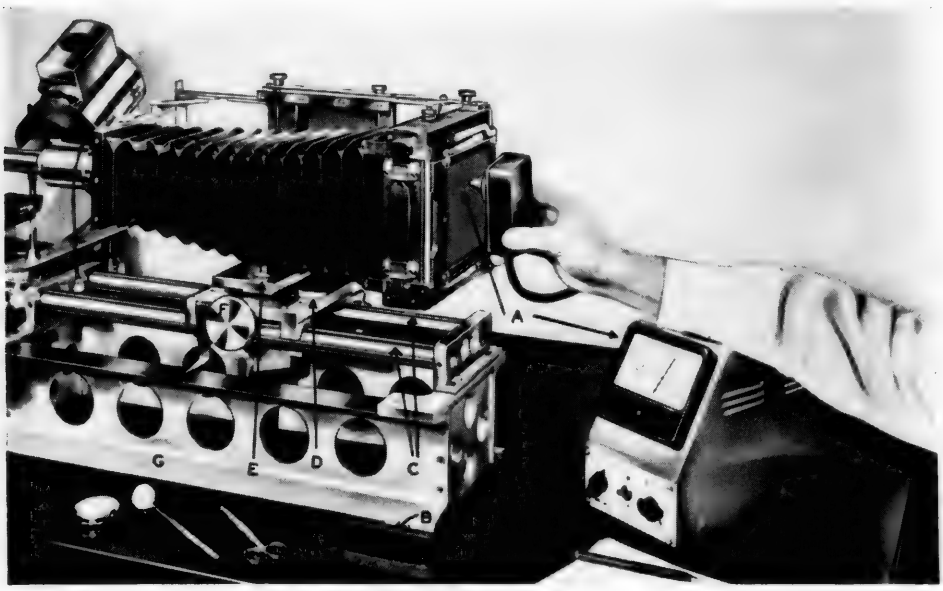


Figure 4. Taking Density or Exposure Readings

A, Still picture readings taken on ground glass—movie readings taken at the aperture by reflection or through reflex focuser. B, Sponge rubber pads; C, Hollow steel rods; D, Lock—to lock camera in position; E, Right angle support to accommodate various cameras; F, Adjustment for height; G, Aluminum alloy channels.

including the number one photoflood which can be used with the 25mm. or longer focal-length objective, if necessary. This lamphouse accommodates the standard water cell and filter holders.

Figure 3 is a general view of the setup for photomicrography. A right angle bracket permits the mounting of any still camera from 2 x 2 up to 5 x 7 inches. Exposure factors can be determined in any manner desired, but readings taken directly on the ground glass with the Densichron probe (Fig. 4) have been plotted and reconciled with motion picture readings taken at the aperture or at the eyepiece of the reflex focuser.

All of the possibilities surrounding the application of this equipment have not been explored. The writer is not in the manufacturing or "machine shop" business but has endeavored to assist others in putting such a unit to work whenever possible.

Back in the early 1930's, the author was privileged to assist Dr. Richard L. Webb,[1] then associated with the University of Illinois in the practical application of this principle to permit the recording of visual findings, so as to allow repetition and group study at leisure. To our knowledge, Doctor Webb was

the first to employ this method of coupling the sixteen millimeter camera to the compound microscope for microcinematography.

Today Dr. Webb and his associate Dr. Paul A. Nicoll[2] are employing a modern version of this principle in their studies of subcutaneous blood flow in the bat's wing. Some modification was necessary to permit the use of dissecting tools during study and recording.

Recently the author had an opportunity of reviewing three most unusual sound movies produced by these workers. The subject, "Subcutaneous Blood Flow in the Bat's Wing" is divided into three parts as follows:

a. Vascular Pattern.
b. Behavior of Blood and Vascular Components.
c. Active Vasomotion.

These films are being released by the Audio-Visual Center, Indiana University, Bloomington, Indiana. It is hoped that Doctors Nicoll and Webb can be persuaded to report on their work and experience in microcinematography in a later issue of the Journal.

(1) Richard L. Webb, Ph.D., Department of Anatomy, Indiana University.
(2) Paul A. Nicoll, Ph.D., Department of Physiology, Indiana University.

Biological Photographs Needed

We wish to obtain, for a forthcoming revision of a widely-used secondary school biology textbook, some especially outstanding and striking black-and-white glossy photo prints for full-page chapter or unit introductory illustrations, at regular commercial rates. The general subjects to be illustrated are: (1) biology in the lives of young people; (2) insect close-ups, damage, or odd forms; (3) plants of garden, field, or forest; (4) living cells; (5) plant anatomical parts; (6) plants as classified into groups, or interesting higher or lower plants; (7) animal classification groups, or striking animals or poses; (8) daily good body health; (9) form and functions of human body; (10) care of human body; (11) reproduction in plants or animals; (1) heredity; (13) evolutionary life changes; (14) conservation, need for or good practices; (15) applications of biology to vocations and hobbies. Contact the addressee below, telling what you can furnish, before submitting prints. Only outstanding views will be considered, at paid rates. We would also consider certain other outstanding general biological photo subjects to be used elsewhere in the book gratis for credit line acknowledgment only. This might be a means for a photographer becoming better known.—B. Bernarr Vance, Daniel Kiser High School, Dayton 4, Ohio.

Electronic Flash in the Photography of Small Animals

J. DRAGESCO *

THE photography of small-sized animals, and particularly of small areas of such animals greatly magnified in the final result—photomacrography—has always been considered as being particularly difficult, whereas actually, with modern techniques placed at our disposal it is possible to obtain very satisfactory results quite easily.

Subjects such as small reptiles, small mammals, and large insects require relatively great "depth" to obtain good, sharp, well defined photographic results. The need for sharpness plus the rapid movement of many such subjects makes it necessary to use small diaphragm openings to obtain depth and fast shutter speeds to stop movement.

In order to increase the depth of field and also in order to make several negatives per subject, it is advantageous to use 24 x 36mm (standard 35mm) apparatus equipped with accessories for close-up photography. Also, for reasons of clarity and for low graininess, the use of a film with reasonably high resolving power such as is obtained with Panatomic-X type films is recommended. Under these conditions and also because of the exposure factor due to "abnormally" large images, even when photographing in full sunlight, one is obliged to use an exposure time of about 1/25 second with an f/9 lens opening. This is as good as saying that the majority of the negatives are going to be slightly fuzzy, either due to insufficient depth of field, or because the animal or the camera moved during exposure.

After numerous unsuccessful tests and experiments to improve depth and definition using regular lighting equipment, the problem was solved by using an electronic flash lamp. In effect, at the short distances at which one works in this particular case (25 to 50 cm), the light emitted by the lamp is about 30 times more powerful than that of the sun. With this type of light source it is possible to use fast shutter speeds and small lens openings and thus avoid any blur due to subject movement and lack of depth in the subject.

We use a Leica camera, synchronized with the electronic flash, equipped with a 5 cm Elmar lens with two extension rings and a device with three, not four, extension legs, omitting one so as not to be bothered by the shadow produced when four legs are used. This provides us with a "focal frame" type

* 6 Rue A Samain, Paris 17, France. Translated from the French at Eastman Kodak Co.

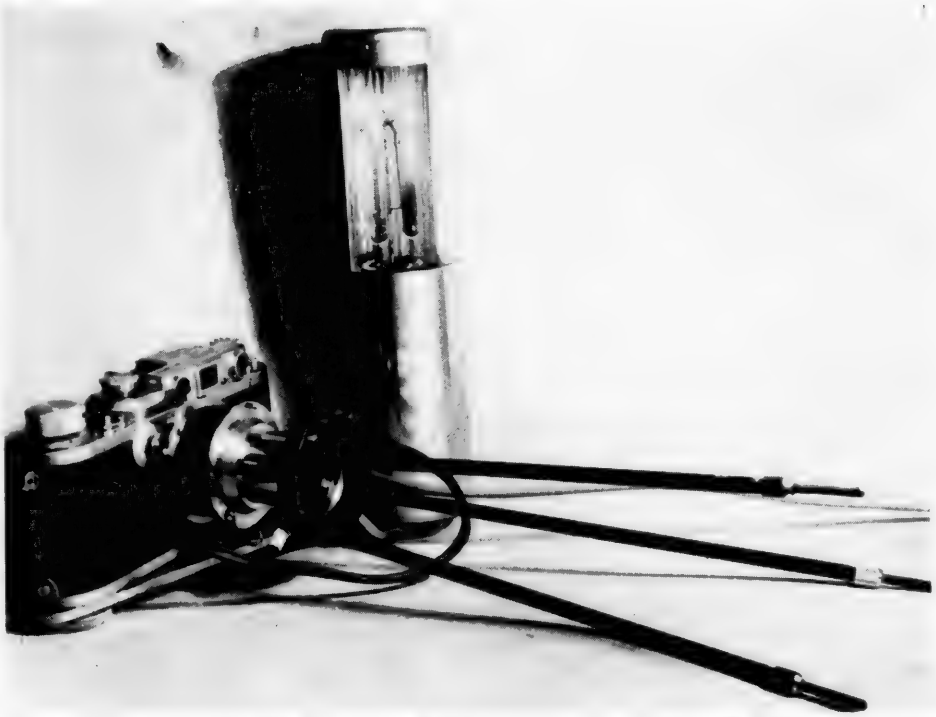


Figure 1. Apparatus for flash pictures of living animals. Leica IIIb with auxiliary reproduction device to locate focal frame and Opteclair, 100 watt-seconds, electronic flash.

of stand which insures accurate framing of subject. We have also tried reflex cameras but for moving objects the focal frame device is much more rapid. The reductions on the film are respectively: 1/8, 1/4 and 1/2, roughly, depending upon the size of the object. The lens is stopped to f/12.5 to f/18 (according to the size and the color of the object) which insures a good depth of field. We use Panatomic-X Film, which we develop in D-76 Developer, and increase the length of development by about 60%. The graininess is hardly perceptible and allows good enlargements 30 x 40 cm. on glossy paper. We sometimes use a Speed Graphic, 6 x 9 cm., equipped with positioning feet, or focal frame. This permits the use of a lens opening of f/22 with Plus-X Film.

The electronic flash, Opteclair, Paris, is fitted with a Mazda 100 Joule (wt-sec.) lamp. The light duration is 1.6 milliseconds, which is advantageous, because the reciprocity failure of the emulsions is minimized. With electronic flashlamps, the image obtained is soft in contrast with normal development. Therefore, to produce negatives of normal contrast, longer development is necessary. The distances separating the flash from the subject photographed being very short (20 to 50 cm), the lighting itself is not flat for it seems to give

Figure 2. Chamelion pardalis (Reunion Island). Leica f:18, Panatomic X film and electronic flash.

shadows very much like those obtained in sunlight. The fine structure of the reptile scales is admirably well brought out. In addition to the light source being unique and small in height, one obtains a reflection in the eyes, which is exactly like that which the sun gives. The photography of small animals becomes particularly easy and within reach of every one when a modern electronic set-up is utilized.

Thyroid Pictures Needed

Pictures in the field of thyroid histology, pathology and therapy are needed, both micro and gross Kodachromes, for advertising and will be used on their customary terms. Any member having material for sale should write to Dr. Heinz Norden, Williams Douglass McAdams, Inc., 45 W. 43rd St., New York, N.Y.

The Intraflex Body-Cavity Camera

WARREN STURGIS*

THE medical photographer today must be versed in the art of taking motion pictures of standard surgical operations, of clinical cases, and of laboratory procedures. He is called on to make films which teach methods of technic, as well as to record original research. He knows how to compose a subject properly, how to light anatomy so that important bony or muscular features are emphasized, and, with proper equipment available, he can take satisfactory photomicrographs. However, when required to shoot pictures in cavities of the body, he has up to now run into problems of illumination, because of the difficulty of projecting a beam of light close enough to the camera lens so that it carries down to the depths of a narrow canal. A second problem occurs when he is asked to take motion pictures through an endoscope, because, although several specialized instruments have been developed for this[1], they are not readily available.

The commercial manufacture of the Intraflex Body-Cavity Camera, first described in June, 1950[2], has now opened up new possibilities for motion picture photography in both of these situations. Enough experience has now been gained from using this camera so that a preliminary report of its value to the medical photographer can be given.

Construction

Basically, the design of the Intraflex Camera is such that a beam of collimated light is projected through a special transmission-reflection mirror onto the object, and the image of this object is reflected by the same mirror into the lens of the camera. Thus the cones of illumination and vision are coaxial in space. This means that, within its limits, whatever is illuminated can be photographed, regardless of the depth of the object or the size of the canal leading to it.

Figure 1 illustrates a simplified scheme of the optical system of the camera. A beam of light from a 1000-watt projection bulb is transmitted through two condenser lenses, and is reflected at a 90-degree angle by an opaque mirror. Passing through a 16-mm. aperture, a projection lens, and the special transmission mirror, it is thrown onto the object. Light reflected from this object returns to this mirror, from which it is reflected at a 90-degree angle and, by means of an image-erecting mirror, into the lens of a 16-mm. motion picture

* Sturgis-Grant Productions, Inc., 314 E. 46th St., New York 17, N.Y. Presented at the 21st Annual Meeting, 1951. Received for publication January 15, 1952.

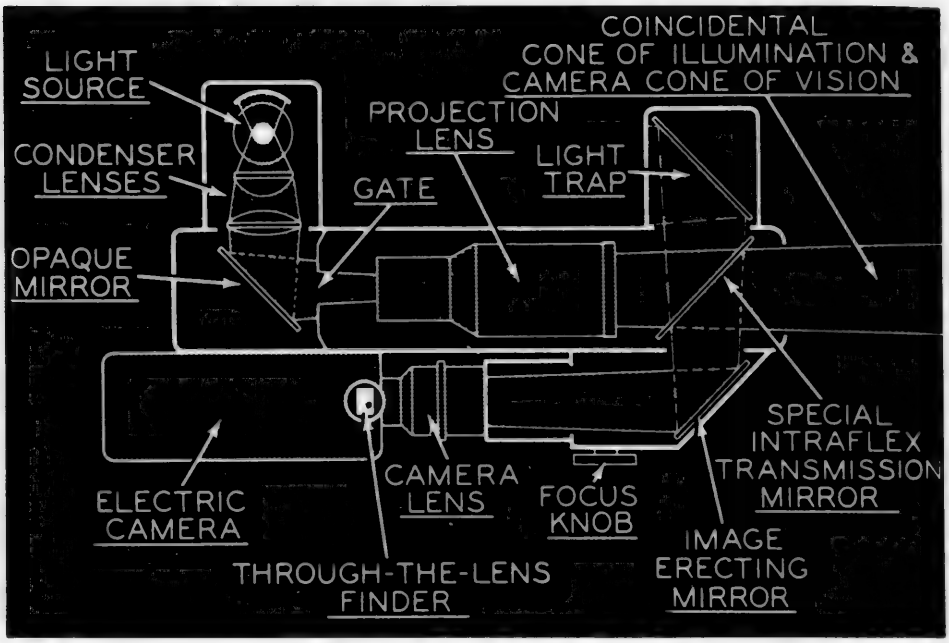


Figure 1. Diagram of the optical system of the Intraflex Camera.

camera. A second transmission-reflection mirror in front of the gate of the camera allows the operator to focus the image on a ground glass, and to view the action at all times, whether the camera is running or not.

Thus one can see how the area illuminated is identical with the image recorded on film. The camera, seen in Figure 2, is a Bell & Howell "GSAP" type, holding a 50-ft. film magazine, and driven by a standard AC motor; taking speeds from 16 to 64 frames per second are available. Both the camera lens and the light projection lens are 3-inch, f4.5 Wollensacks. They are coupled together, so that turning the round knob seen at the side brings the light into focus on the object, and the image into focus at the film plane. The field can be brought into focus between 10 and 30 inches from the front of the lens, the width of the field varying from 1½ to 4 inches respectively at these distances.

The lamphouse is held constantly in a vertical position by means of a bracket arm fastened to the tripod head, shown in Figure 3, a small blower is attached behind the lamp house in order to reduce heat from the lamp to a negligible minimum. The tripod supplied for use with the camera has a simple friction pan-and-tilt mechanism, which provides for mobility in both directions by a single, slight rotation of the handle. The tripod head is mounted on a single upright post, and is raised or lowered by a ratchet-and-gear drive, as can be seen in

Figure 2. Intraflex Camera mounted on tripod shown in upper right; and (left) with adapter for endoscopy mounted on the camera; accessory cones held in hand.

Figure 2. Two extensions on each leg of the tripod allow a variation in height of between 26 and 76 inches from the floor. Camera and tripod together weigh 21 pounds.

Method of Use

For direct photography, the camera is secured to the tripod head, and brought into a position somewhere between 10 and 30 inches from the object, the exact spot depending on the conditions and the size of field desired. The light of the camera itself generally provides sufficient illumination for the doctor during a surgical operation, and, since there is very little heat on the object, it may be left on for a protracted time.

The photographer focuses through the finder on the ground glass, and reads off the letter indicated on the focusing knob. From a simple calibrated chart, on the top surface of the camera, he finds a figure for the lens opening which

Figure 3. Intraflex Camera, reverse side from figure 2, showing tripod bracket, lamphouse, and blower motor.

corresponds (at a given camera speed) with the letter indicating the distance, and sets the diaphragm accordingly. If the plane of focus gets deeper as the operation proceeds, he refocuses during the procedure, being careful to change his diaphragm opening in accordance with the new setting. Arbitrary letters and figures have been assigned to both distance and diaphragm settings to make this process as quick and foolproof as possible. The surgeon may himself check the field at any time, through a side-view finder (seen in front of the focusing knob in Figure 2), which is also part of the optical system.

In endoscopic photography a cone-like adapter is screwed onto the front of the camera. This is shown in Figure 2, along with several sizes of small accessory cones to fit into the end of the particular endoscope being used. The smallest instrument for which such adaptation is possible is one having a diameter of 3/8 inch. Since the camera is mounted rigidly, no attempt has been made to secure a firm union between the cone and the instrument, as such an arrangement could cause injury to the patient. (Although the Intraflex can be hand held, its weight precludes holding it steady enough in the axis of the endoscope to make this very practical.)

Adaptability

Because of the flat illumination provided, the Intraflex provides shadowless pictures of small areas on the surface of the body. Minor surgery, as in dermatology, is an example of this adaptation. The cooling system prevents the tissues from burning under the light. This feature, as well as its flexibility and compactness, makes it particularly suited for photographing eye surgery. One interesting phenomenon has been observed in such work: when the light beam is directed at the pupil, it is projected through the lens of the eye, and reflected back from the retina, giving a "red reflex". The surface during surgery of the cornea is therefore not seen quite as clearly as when oblique lighting is used, but for every other type of ophthalmologic work the Intraflex is ideal.

Two special fields in which deep-cavity illumination is a necessity are oral and genito-urinary surgery. Because of the small area in which the surgeon works, generally many inches within the surface of the body, it is difficult to secure good pictures by ordinary lighting methods. With Intraflex illumination, however, the beam of light penetrates to the depths of a narrow canal. Moreover, the surgeon is aware when his hands cover up the action, since he automatically shuts off the light from his own field of vision. Thus he is forced to do his best to keep his hands to the side, out of the way of the picture.

The Intraflex finds definite application in the field of gynecology, for photography of the cervix uteri is easily accomplished through a standard bivalve speculum. However, because of the comparatively small photographic field, it is not suited for recording extensive surgical procedures, such as abdominal or orthopedic operations.

In using the Intraflex to photograph through an endoscope, its greatest value has been found in recording rectal conditions, for most proctoscopes have comparatively large diameters, and an image of about one-quarter the width of the photographic field can usually be obtained. As yet it has been possible to photograph only individual areas, but a system is under development to permit the instrument and camera to be withdrawn simultaneously, so that consecutive fields of the inside of the bowel may be shown.

Indirect, or mirror, laryngoscopy is a procedure easily photographed with this camera, and clear views of the upper larynx and vocal cords are obtained. However, the length and small bore of even the largest of endoscopes used makes it difficult to secure good pictures of trachea or bronchi unless the patient is under a general anesthetic (spinal or intravenous). If the patient is under local anesthesia only, photography requires utmost cooperation by all concerned, since the slightest movement on the part of the patient will disturb the axis of

alignment, and necessitate extra time while the camera is being re-adjusted. Since the patient's welfare is obviously the first consideration, photographer and doctor should be aware of this problem before any such work is undertaken.

(Endoscopes with built-in optical systems cannot be used in conjunction with the Intraflex.)

Summary

A new type of body-cavity camera, the Intraflex, has been described in this preliminary report. Employing a beam of collimated light coincidental with the exact axis of the image reflected back into the lens, it provides flat lighting of surfaces, and direct illumination of deep surgical cavities or of body cavities seen through properly adapted endoscopes. The limitations as to size and depth of field must be recognized. At present, because of the electric motors, it cannot be used in the presence of explosive gases. Its advantages over most types of cameras for this special work are: flexibility; speed of positioning; ease of adjusting focus and diaphragm; intense, cool light on the object; direct illumination of the field as seen by the surgeon, and as recorded on the motion picture film, in color or in black and white.

[1] Brubaker, J. D. and Holinger, Paul H. 1947. An endoscopic motion picture camera for otolaryngology and broncho-esophagology. J. Biol. Phot. Assn. 15: 171-192.

[2] Neyhart, A. P. 1950. A simplified body-cavity camera. J. Soc. Mot. Pic. Telev. Eng. 54: 747-753.

Book Review

Horses. **Edited by Byran Holme. Introduction by Alleine Dodge. Studio-Crowell, New York 16, $3.50.**

This is an interesting collection of approximately 130 Horse pictures. The illustrations depict practically all types of saddle, harness and draft horses. It also includes circus horses, polo, trotting, racing, hunting, jumping and rodeo horses, and horses in herds, as visualized by artists and photographers throughout the ages. The introduction by Alleine Dodge traces the history of horses and its depictions in art from the earliest times to the present.

Bryan Holme, the editor, has exhibited his skill in selecting masterpieces of some of the great artists, including da Vinci, Dűrer, Rembrandt, Rubens and others. The photographers represented are also eminent, and Adams, Munkacsi, Rawlings, Horst, Frissell, Borsig, Dmitri and others have contributed.

The book should warm the hearts of horse lovers.—Edmond J. Farris

Lens Data Tables and Design Calculations for Open-Tube Endoscopic, Cavity, and Close-Up Photography

J. D. BRUBAKER*

Introduction

IN the design of cameras for open-tube endoscopes, several factors combine to determine the choice of lens focal-length. These factors are: (1) length of endoscope, (2) illumination level on the field, (3) magnification, and (4) diameter of the tube through the 45 degree mirror (proximal illumination) which determines the maximum lens entrance-pupil diameter. The data and graphs (of conjugate focal distances, true f-stop, entrance pupil diameter, and depth of field) governing these factors and their relationships to each other are also of value in calculating lens focal-lengths and f-stops for cavity photography and other close-up work at specific magnifications.

During the course of development of open-tube endoscopic cameras, certain other general information has been developed which is supplementary to the papers already published on these cameras[1,2,3,4,5]. It is presented here, so that anyone desiring to examine the practicality of a proposed type of endoscopic, cavity, or close-up photography, can determine the optical soundness of a proposed design, using the short-cuts provided in the tables, graphs, and diagrams, all of which serve as graphic aids to thinking the problem through.

Equipment with proximal coaxial lighting for still or motion picture photography of cavities or through short specula (where the speculum is not attached to the camera, Figure 1, 2,) is basically similar to cameras for open-tube endoscopes. The optical restrictions of the illuminating beam (such as are caused by an open-tube endoscope) are eliminated in cavity photography, giving a wider choice of working-distance, diameter of tube through the mirror, and size of flash-bulb reflector or condenser lens diameter. The lens focal-length can be chosen to obtain the most convenient lens-field working distance, consistent with the illumination level it is possible to produce at that distance.

The problems encountered in taking very small sharp images in color at magnifications between 0.2 and 1.0, are not covered adequately in most handbooks of photography. This lesser-explored special region in a sense lies between general

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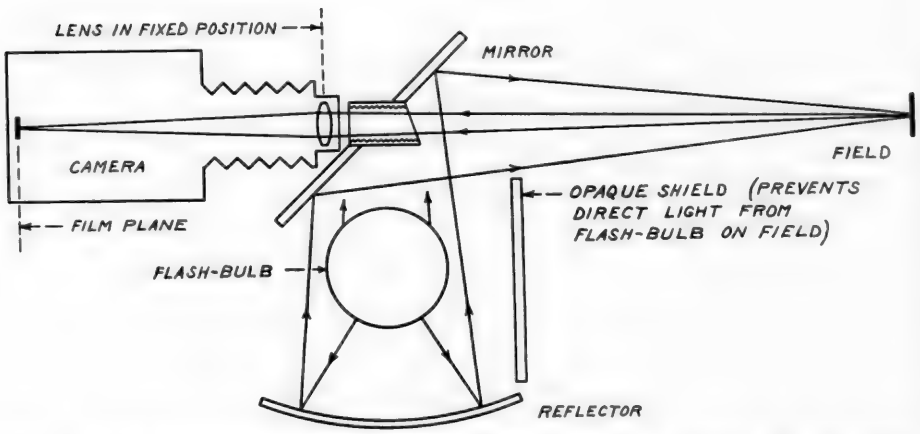


Figure 1. Still camera diagram for cavity photography. (Auxiliary tungsten lamp not shown.)

clinical photography and low-power photomicrography, and requires either hand-held, or portable tripod-mounted equipment for photographing living tissues, in contrast to a heavy fixed photomicrograph outfit for photographing microscope slides or specimens. The axioms presented here point out some little recognized relationships in photography at magnifications between 0.2 and 1.0. Most of the tables and graphs are keyed to magnification.

The main text of this paper covers the general principles, tables, graphs, and axioms, having broad application. The appendix contains more detail on various factors which contribute to a successful design, as well as some specific data and constructional methods. Of particular value are the illustrations devoted to showing by means of three series of three cases each (figures 3, 4, 5), how various factors affect magnification, light-level required on the field, choice of lens focal-length, lens-field distance, lens position, and total field-to-lens distance.

General Discussion

To obtain simultaneously a large image on the film and adequate depth of field is relatively difficult in still photography because of the problem of increasing the light-level on the field above a certain amount (which is obtainable with flash-bulbs). The data shows that simple one-length short open-tube endoscope cameras, such as the laryngoscope or proctoscope, offer the best possibility of relatively large pictures on the film.

With open-tube endoscopes, for a *fixed lens-field distance* and for a *fixed tube diameter* through the 45 degree mirror, *the light-level needed on the field increases at a rate exactly equal to the square of the magnification.* Increases beyond 0.7 magnification are difficult to obtain in practice, with instantaneous exposures of 1/20 sec. or faster.

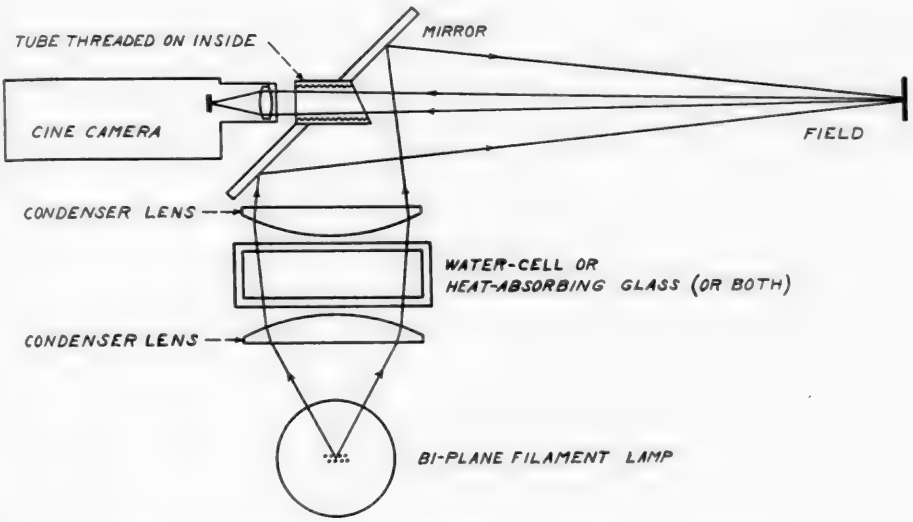
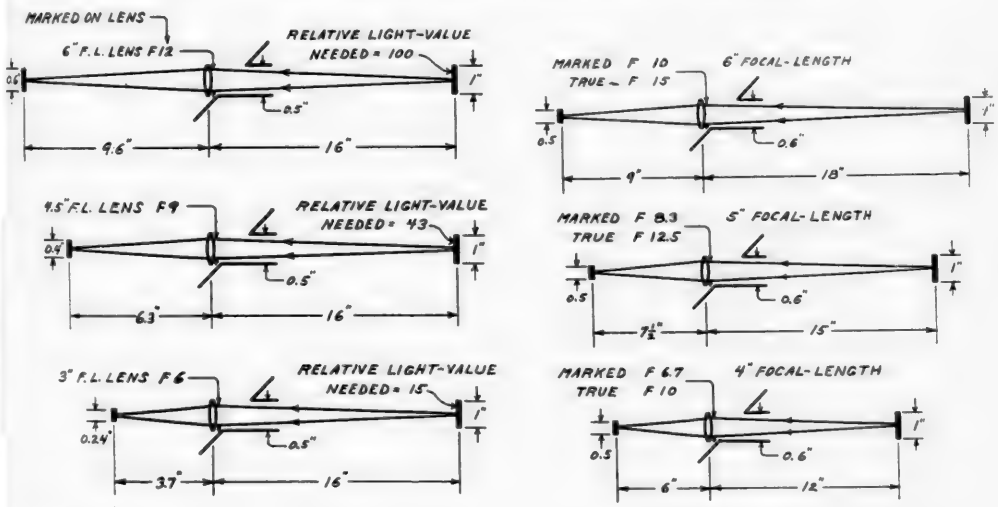


Figure 2. Motion picture camera diagram for cavity photography.



FOR FIXED LENS-TO-FIELD DISTANCE, AND FIXED TUBE DIAMETER, SHORTER FOCAL-LENGTH LENS PRODUCES LOWER MAGNIFICATION AND LARGER APERTURE

FOR FIXED TUBE DIA. AT SAME MAGNIFICATION, SHORTER LENS-TO-FIELD DISTANCE PERMITS LARGER APERTURE WITH SHORTER FOCAL-LENGTH LENS

Figure 3. (Left). Relationship between light-value on field, magnification, and lens focal-length.
Figure 4. (Right). Shorter lens-field distance provides more light-grasp.

Marked f-stops are those engraved on the lens mount.

True f-stops are those which have been corrected for lens extension at the indicated magnification.

The apertures given are the maximum diameter entrance-pupil possible as limited by the indicated tube size through the 45 degree mirror.

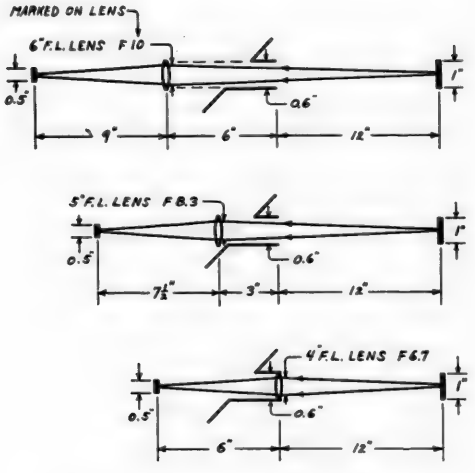


Figure 5. Showing why lens should be kept close to mirror and field.

The term magnification is used here as the ratio of film image diameter to field diameter, usually being less than one, and expressed as a decimal (see figure 6). This discussion applies primarily to magnifications between 0.2 and 1.0.

The specific data given are based upon the use of color film having ASA speed 12, but of course the equipment can be used for black and white at smaller stops. or can be designed for a higher magnification with the faster black and white film. If both color and black and white pictures are wanted, it is best to take the originals in color, and make black and white negatives from them.

The word "field" is used here to denote the object plane of sharp focus, and is used instead of the usual term "subject" or "object".

Choice of Lens Types

Endoscopic and cavity still photography produce much smaller images than is ordinarily done in most close-up clinical photography using sheet-film size cameras at comparable magnifications, placing much more importance on very sharp detail in the image. Using ordinary magnifiers, it is difficult for the inexperienced person to judge the sharpness of small images in color transparencies made with experimental equipment; therefore a somewhat theoretical approach to the choice of lens is necessary in order to produce acceptably sharp images on the film.

In still pictures, the film-image diameter is very small in relation to the lens-film distance. The lens must produce a sharp image only over a small angular field of view; the sharpness should equal that of images in a 16mm motion picture film. The lens operates at a small aperture, to obtain adequate depth of field, usually between f/11 and f/22.

Most properly manufactured modern color-corrected lenses will produce acceptably sharp very small images, regardless of the lens focal-length, at marked apertures between f/11 and f/22, at magnifications discussed here. With suitably chosen lenses, at f/11 to f/22, a mathematical point at the object plane of sharp focus is imaged at the film plane as a dot about .001 inch (.025mm) or less in diameter.

The most suitable types of lenses fall into two classifications (but other types may perform satisfactorily): (1) the symmetrical lenses which have each half composed of several elements cemented together, with only one air-space which is located at the diaphragm. The Goerz Dagor and the Turner-Reich process lenses are of this type. Symmetrical lenses with more than one air-space are often much less suitable; some produce an inferior image from the standpoint of sharpness, and may have excess ghost-light on the image area due to the multiple internal reflections. (2) The modern color-corrected precision enlarging lenses which are optically corrected for close lens-field distances; these usually are of the Tessar type of construction. Ordinary Tessar lenses of the 2-b f/6.3 series also are suitable when stopped down to f/11 or beyond. Most ordinary Tessar lenses designed for use on cameras have adequately sharp image-forming qualities at and near the center of the field, and are pretty well corrected for color. Coated lenses are desirable.

For simple cameras, high grade achromatic lenses such as are used for objectives in some small instrument-type telescopes, produce satisfactory images with almost no noticeable blurring. This is because the angle of view is small, and the lenses are well corrected for small angles of view. Some large optical companies regularly manufacture precision objectives for use in their own products; such lenses are often of great value where space does not permit the use of a standard size photographic lens. The f/6.3 Tessar series also occupy a smaller space than most f/4.5 lenses.

The final criterion of performance is to test the lens by actual photography at the proposed magnification of a suitable target, (such as a 4-color illustration printed from half-tone type printing plates, or a black and white fine-screen half tone illustration,) using color film. A rough estimate of the sharpness of image can be obtained by examining the aerial image at the taking f-stop with a 10X or 20X triple-aplanat magnifier or low-power microscope as described in the appendix.

(To be Continued)

Book Reviews

Annual Report on Stress. **Hans Selye. Acta, Inc., Montreal, Canada. 1951. 644 pp. Illus. $14.00.**

Selye has elaborated an interpretation of bodily reactions to pressure from the outside, or within the individual. The report is a critical analysis and summary of some three thousand contributions to this field published during the past year. The considerable number of photomicrographic, specimen and patient pictures are above average and a few of them are very good. It is encouraging to note that biological photographs are playing an increasing role, even in publications like this, which appraise the reader of the status of an expanding field of physiology and medicine where there are yet too few facts for full agreement among the investigators.—O.W.R.

Phase Microscopy—Principles and Applications, **by Alva H. Bennett, Helen Jupnik, Harold Osterberg and Oscar W. Richards, John Wiley and Sons, Inc., New York, 320 pages, 1951, cloth $7.50.**

This book is a collective work covering all aspects of phase microscopy and its applications, written by four members of the Research Laboratory of the American Optical Company. There are seven main chapters, each with numerous sub-headings. The chapters are logically arranged to present in order, the historical background and optical fundamentals, the elementary theory of phase microscopy, instrumentation, technics, applications in biology and medicine, applications in industry, and an advanced discussion on the diffraction theory of phase microscopy with Kőhler illumination. A comprehensive bibliography and index completes the book.

To the practical worker Dr. Bennett's brief, but lucid, presentation of optical fundamentals in chapter I, and Dr. Richards' three chapters on technics and applications (IV, V and VI) will probably prove the most useful and understandable. The chapters on theory (II and VII) by Dr. Osterberg may prove too mathematical in treatment for the non-specialist, except the first part of Chapter II which requires nothing beyond the simplest mathematical concepts for understanding. Dr. Jupnik's discussion of instrumentation (III) is of value for teaching one the essential principles of phase microscopic equipment. It was a pleasure for this reviewer to see that in this chapter the book did not turn suddenly "commercial". On the contrary, the same scholarly and unpre-

judiced approach is maintained as in other chapters, and many more illustrations of competitive equipment are included than are those of American Optical Company equipment.

The book is well illustrated, nicely bound and printed on first-rate paper stock. It was obviously written and produced for frequent reference over a period of many years, which any worker in microscopy will find to be the case.—L.E.V.

Medical and Biological Illustration

January 1952

Teaching Charts for Nurses.

Planning a Medical Exhibition, Sylvia Treadgold.

Illustrating the Exhibit, Derek Martin.

Modern Apparatus for Stereoscopic Photography, Jack H. Coote.

The Use of Electronic Flash in Medical Photography, Peter N. Cardew.

An Apparatus for Phase-Contrast Kinemicrography, Percy Cliffe.

Application of Isotope Tracer Technique in the Manufacture of Animal Feeding Stuffs, E. Swindlehurst and E. G. Woodrofe.

New Equipment and methods:

A New Ring Illuminator (E.D.M. 500), Peter Hansell.

Bausch and Lomb Retinal Camera.

A Method of recording Cleft Palate in the Infant, John Hainsworth.

Concealed Mounting for Drawings and Prints.

Abstracts. Book Reviews. Motion Pictures. Exhibitions. Reports from Societies.

Subscription $7.00. Publishing Manager, B.M.A House, Tavistork Square, London W.C.1, England.

Association News

Dr. Paul H. Hollinger received a certificate of merit for the best teaching film reviewed in 1951 by the American College of Surgeons. The film is "The endoscopic appearance of Diseases of the Trachea."

Leo Massopust is listed on the program of the American Association of Anatomists for a paper on vascular patterns disclosed by infrared photography.

The *Lab World,* the news magazine of the clinical, scientific laboratory field carried a very nice article on our *Association* in the February 1952 number.

The *B.P.A.* Boston Annual Meeting was reviewed in the 1951 November-December issue of the *New York State Photographer.*

Samuel Dunton and Dr. Roman Vishniac have been named judges for the *P.S.A.* Nature Division jury.

Margaret Markham tells about motion picture photography in an article "The Bolex and the Eye" published in the Spring 1952 issue of the *Bolex Reporter.*

Moving?? Each time the Journal is mailed a number of copies are returned by the Post Office with the notation that the member has moved and left no forwarding address, or no authorization for forwarding the Journal. Our Secretary then tries to trace the member. Change of address should reach the secretary at least one month before the mailing of the Journal.

What are you doing? Send information to our Secretary, Mr. Lloyd Varden, Pavelle Color, Inc., 533 W. 57th Street, New York 19, N.Y.

Chapter News*

Chicago Chapter: A paper on "Utilizing New Photographic Technics in Neuro-Physiological Research" by Dr. Seymour N. Stein started the year's activities in January. The following month Mr. Marvin Camras discussed "Magnetic Sound for Biological Motion Pictures", and the March meeting was addressed by Mr. James Glaze on "Color Temperature Meters and Color Filters."

New York Chapter: Dr. Roman Vishniac, twice winner of first place in the Annual Salon of this chapter, gave a talk, beautifully illustrated by transparencies, on "The Dynamic Approach in Scientific and Nature Photography" in January. The February meeting was devoted to a symposium on "The Cold Cathode Light", which included a discussion of the "Gradacon" lamp by Mr. Andrew Azan, and of the "Varigam" paper by Mr. Owen Billman; their applications to scientific photography were summarized by Mr. Julius Weber. "Trends of Design and Technics in Photomicrography" was the subject of Professor

* Warren Sturgis, Chairman, Chapter Committee, 314 E. 46th St., New York 17, N.Y.

Francesco Scandone in March, at which time he demonstrated the remarkable Galileo equipment.

Northern Ohio Chapter: Monthly meetings this year have covered a variety of topics, including "Retinal Photography" by Mr. David Lubin, a symposium on "Laryngeal Photography", led by Mr. Fred Beal, and illustrated with motion pictures, and organization plans for a Salon to be exhibited in connection with the Cleveland Dental Society.

Philadelphia Chapter: In January Mr. Warren Sturgis addressed the members, outlining some of the functions and activities of a B.P.A. Chapter. He followed this with a talk on "Teaching with Motion Pictures", and showed examples of different types of films to illustrate his points.

Rochester, N.Y. Chapter: Motion pictuers ("Pre-Frontal Lobotomy" and "Control of Light by Filters"), equipment demonstration (Ascor Speedlight, by Mr. Harry L. Parker), and a discussion of "Polarization Characteristics" and "Control of Highlights by Polarization", by Mr. H. Lou Gibson and Mr. Charles Reiner respectively, effectively filled the programs for the first three months of 1952.

Southern California Chapter: Two interesting meetings this year have been concerned with theory. Miss Elizabeth Franklin of the Art Center School of Photography spoke on "Basic Principles of Composition", and Dr. Loren Graham discussed "Color Theory for Photographers". "Photography of the Eye", illustrated by transparencies, was the subject of Dr. John L. Langton's paper at the March meeting.

Book Review

***Optics* by Francis Weston Sears. Addison-Wesley Press, Cambridge 42, Mass. 3rd ed. 369 pp. Illus. 1949. $6.50.**

An elementary book that covers the nature of light, reflection, refraction, lenses, optical instruments (eye, microscope, telescope, etc.), polarization, interference, diffraction, resolution, line spectra, thermal radiation, photometry and color. It is well illustrated so that a picture reader can get some idea of optics. Simple lens combinations can be figured out from the basic equations that require only high school algebra for their solution. Photographers will wish that more space had been given to camera lenses. Sears' book should serve to prepare the photographer for reading the specialized books and its virtue is an understandable, balanced, basic treatment that will tempt the reader to go farther.

—O.W.R.

*Special price to our members. If you refer to the BPA Journal and enclose check with order, you can obtain a copy, postpaid, for $5.20 direct from the Addison-Wesley Press, Cambridge 42, Mass.—Editor

A Preliminary Report on the B.P.A. Membership Drive

By

HARRIS B. TUTTLE*, F.B.P.A.

AS most of you already know, the BPA has enjoyed a steady growth since it was organized 21 years ago. A little money was put aside each year for the rainy day. The rainy day came all too quickly. Every day has been rainy since prices started to raise in 1945.

The BPA officers have done a splendid job during these past few years and the money save in the good years has helped to carry us through. Now we have reached a point where the continued increases in the cost of printing the Journal and the general expenses of just running a society are remaining at a level higher than our yearly income.

As you already know, the BPA Board voted not to increase the membership dues. Rather, they decided to conduct a membership drive as a means of increasing income and asked me to act as Chairman.

Considerable study was given to the problem — How to increase income sufficient to balance the budget without raising dues.

We finally decided on a three-point program.

1. To ask each member to try and get *one new member,* or about 800 new members at $5.00 each — $4,000.00.
2. To ask each of the present members who could afford to do so to become contributing members and contribute any amount they cared to over and above their normal membership dues. This could be $.50, $1.00, $2.00, $5.00, $10.00 or more. However, it should be an amount that could be given each year without personal sacrifice. The Association must have a fairly uniform yearly income of an amount that can be counted on from year to year. BPA dues and contributions are deductible on federal income tax returns.

   We estimated and were hopeful that about one-half of the present BPA members might become contributing members, and produce about $1,000.00 a year in new income.
3. We decided to invite the industrial and commercial friends of BPA to become sustaining members. We did not set an estimate

* Address — 343 State Street, Rochester 4, New York.

on such income but were hopeful it might reach the $1,000.00 a year mark.

I wrote a letter to all BPA members in October and November which outlined this program. Up to February 15, 1952, the results were as follows:

In response to point No. 1, we have obtained 83 new members or $415.00 in new income.

In response to point No. 2, we have obtained 103 contributing members or $630.50 in new income. Eight were contributing members previously. We are grateful for this excellent response.

In response to point No. 3, we have obtained 16 sustaining members, or $765.00 in new income.

Memberships of all types have given the Association $1,810.50 in new income. This will go a long way to help balance the budget, but we need a lot more to reach our goal. Seven hundred new members, three hundred more contributing members, and ten more sustaining members.

Ask yourself whether or not you have done your share. (1) Did you get a new member? (2) Did you become a contributing member? (3) Did you send in names of good prospects for membership to the Membership Chairman?

The Association is in a healthy growing condition right now. Let's each one of us do our share to keep it that way.

I should like to thank all who have contributed of their time and money to help make the membership drive a success so far.

Biological Photographic Association Fellowship Notice

The Fellowship Committee of the Society wishes to call every member's attention to the qualifications for becoming a Fellow in the Biological Photographic Association. Previous issues of the JOURNAL have given the requirements for Fellowship and copies of these requirements may be obtained by writing to the Secretary of the Fellowship Committee, Miss Anne Shiras, Photographic Department, Magee Hospital, Pittsburgh 13, Pennsylvania. If you, as a member of the Society, know of someone who should be a Fellow of the Society, the Committee asks you to get in touch with their Secretary for further details. It should be the duty of every member to see that all qualified members are considered by the Fellowship Committee.

Sustaining Members

American Speedlight Corporation, New York 17, New York
Ansco Division, General Aniline & Film Corp., Binghamton, N.Y.
Bausch & Lomb Optical Company, Rochester, N.Y.
Bell & Howell Company, Chicago 45, Ill.
Bolsey Corporation of America, New York 10, N.Y.
Burleigh Brooks Company, New York 36, New York
Coreco Research Corporation, 1908 Broadway, New York 23, N.Y.
Elgeet Optical Company, Rochester 6, N.Y.
Oscar Fisher Company, Peekskill, N.Y.
W. J. German, Inc., Fort Lee, New Jersey
Harrison & Harrison, Los Angeles 38, Calif.
Kling Photo Supply Corporation, New York, N.Y.
Paillard Products, Inc., New York 16, New York
Photo Research Corporation, Burbank, California
J. G. Saltzman, Inc., New York 17, New York
Silge & Kuhne, San Francisco 8, California
Wollensak Optical Company, Rochester 21, N.Y.

Contributing Members

Harold C. Baitz, Buffalo, N.Y.
Dr. Edgar C. Baker, Youngstown, Ohio
A. V. Banones, E. Cleveland 12, Ohio
Edna Campbell Barker, San Diego, Calif.
John J. Beiter, Rochester 8, New York
Tibor Benedek, M.D., Chicago 2, Ill.
Lester V. Bergman, Brooklyn 13, N.Y.
Ketura D. Blakely, New York, N.Y.
Dr. Clarence Blanchard, Los Angeles, Calif.
Rush M. Blodgett, Jr., La Canada, Calif.
Dr. Ray H. Bradbury, Mt. Vernon, Wash.
Percy W. Brooks, Jackson Heights, N.Y.
Robert A. Brown, Charleston, S.C.
J. D. Brubaker, Evanston, Ill.
James E. Brubaker, Waukegan, Illinois
Jasper D. Bush, Gadsden, Ala.
William J. Cameron, Batavia, N.Y.
Richard O. Malcomson, Mt. Pleasant, Mich.
Robert Mallory III, M.D., Rye, N.Y.
William L. M. Martinson, Los Angeles 24, Calif.
Dr. George Matula, Chicago, Ill.
Ervin W. Miller, Rochester, Minn.
Joseph Edward Mineo, Tucson, Ariz.
Henry W. Morris, Minneapolis, Minn.
E. E. Myers, M.D., Philippi, W. Va.
Bert E. Newkirk, Jr., Lincoln, Neb.
Merwyn C. Orser, Rochester, N.Y.
Miss Ann G. Pass, Durham, N.C.
Leonard Perskie, Forest Hills, L.I., N.Y.
Philip F. Peterson, Schenectady, N.Y.
Henry F. Pickett, Durham, N.C.
Morris J. Pickett, Oceanside, Calif.
Robert G. Polk, Port Washington, N.Y.

Philip A. Conrath, St. Louis 4, Mo.
Marian K. Dawes, Boston 18, Mass.
Edward Drewello, Miami, Fla.
Wynne E. Eastman, Houston, Texas
C. Graham Eddy, Washington 25, D.C.
Martin E. Edwards, Reading, Penna.
M. J. V. Ettlinger, Hove 2, Sussex, England
Dr. E. J. Farris, Philadelphia, Pa.
Louis Paul Flory, Chevy Chase, Md.
A. Wilson Footer, M.D., Oakland 9, Calif.
Julius Fuchs, M.D., New York 28, N.Y.
Larry C. Gaskins, Washington, D.C.
John A. Gaughan, Rochester 8, N.Y.
H. Lou Gibson, Rochester 4, N.Y.
D. M. Glover, M.D., Cleveland Heights 18, Ohio
Alex A. Gravesen, Memphis 17, Tenn.
Avis Gregersen, Los Angeles, Calif.
Miss Ursula V. Gugliotti, Waterbury 69, Conn.
C. G. de Gutierrez-Mahoney, New York, N.Y.
Robert C. Hansom, Wilson, Conn.
Ferdinand R. Harding, 300 Longwood Avenue, Boston 15, Mass.
Rudolph J. Henning, Parkchester, N.Y.
Charles L. Hess, M.D., Wickenburg, Arizona
David Hilbrand, Oklahoma City, Okla.
Paul H. Holinger, Chicago, Ill.
N. S. Horton, Montreal, Canada
Carlos D. Houghton, Philadelphia 14, Pa.
Dr. R. F. Hughes, Hamilton, Canada
Frederick R. Hults, San Antonio 9, Texas
Joseph T. Jackson, Emory University, Ga.
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Dr. Thomas J. Kirwin, New York, N.Y.
Victor R. Landi, Clifton, Va.
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Albert Levin, Pittsburgh 13, Pa.
K. Cramer Lewis, St. Louis 10, Mo.
R. P. Loveland, Rochester, N.Y.
Marjorie L. Pressey, Sun Valley, Calif.
Arthur W. Proetz, M.D., St. Louis 8, Mo.
Dr. William A. Quijano, San Antonio, Texas
S. M. Rabson, M.D., Fort Wayne, Ind.
Dr. S. Rath, Institute for Muscle Research, New York, N.Y.
Charles G. Reiner, Rochester, N.Y.
Dr. Edward W. Robbins, Philadelphia 47, Pa.
William H. Robinson, Hot Springs, Ark.
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Lt. Merrill W. Rusher, Philadelphia, Pa.
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Thomas M. Scanlan, Chicago 51, Ill.
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Morris Schwartz, Plainville, Conn.
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Anne Shiras, Pittsburgh, Pa.
George B. Sickel, M.D., Chester, Penna.
Fred F. Sielaff, Chicago, Ill.
William Stevenson, Cleveland, Ohio
Calvin L. Stuckner, New Orleans, La.
Warren Sturgis, New York 17, N.Y.
Joseph W. Tandatnick, M.D., Bronx, N.Y.
Dr. Harvey E. Thorpe, Pittsburgh, Penna.
Howard T. Toenniges, W. Des Moines, Iowa
Felix Traugott, Jersey City 4, N.J.
Morton F. Trippe, M.D., Ashbury Park, N.J.
Harris B. Tuttle, Rochester, N.Y.
Lloyd E. Varden, New York, N.Y.
Leon M. Vincent, Brighton, Mass.
Linden J. Wallner, M.D., Skokie, Illinois
Julius Weber, Riverdale 63, N.Y.
Samuel Weiss, M.D., New York 23, N.Y.
Thomas L. Wood, New York 25, N.Y.
Verlin Y. Yamamoto, Des Moines 9, Iowa
Stella Zimmer, Syracuse, N.Y.

Announcements and New Products

The *George Eastman House,* 900 East Ave., Rochester 7, N.Y., is publishing a very interesting journal called *"Image".* The publication brings material from this museum of photography to those who cannot visit in person. The second issue has a delightful article on "The Focimiter" and depth of field, and includes a superb reproduction of Julia Margaret Cameron's 1867 portrait of Sir John F. W. Herschel.

The *United Civil Service Commission* announces examinations for Scientific Illustrator (Medical) $3410 to $5060 and Medical Photographer $2950 to $4205 per year. Information can be had from most first and second class post offices, or from the Commission in Washington. Eddy has written to the Editor stating that the purpose of the examination is to establish a central register for the Veterans Administration and for applicants. The examination for medical photographer is open up to grade 7. Grades 8 and 9 are ordinarily filled by promotion from within the Administration, although they are open when they cannot be filled by promotion.

Silge & Kuhn have moved to larger and better quarters at 375 Sutter Street, San Francisco 8, Calif.

The Photographic Society of America Convention will be held August 12th through 16th at the Hotel New Yorker in New York City. This meeting will be open to nonmembers at the same fee as members, namely $5 for individuals for the meeting, or $2 per day for those unable to attend the entire meeting. Non-members may get blanks from the Registration Committee, c/o Metropolitan Camera Club Council, 310 Riverside Drive, New York, N.Y. The exhibit will include: pictorial, technical, nature, stereo, color slides, photo journalism and motion picture divisions. Closing date will be July 10 and application blanks can be obtained from the above address, except for the technical division which should be addressed to Earl R. Clark, 184 Malden St., Rochester 13, N.Y.

The National Carbon Company, 30 E. 42nd Street, New York 17, N.Y., offers a reprint of an article on new flash tube circuits which reduce battery drain and include data on design and performance.

Ansco announces that Ansco Color (Daylight Type) and Ansco Supreme are available in the 828 (28x40 mm) size at 98c and 48c respectively including tax. Cykora has a new surface "GL" which may be dried with a natural semi-gloss finish, or may be ferrotyped to a high gloss finish. Ansco's Cykora GL DW is available in grades 1, 2, and 3 in. 5x7, 8x10, and 11x14 in. standard

packages and larger sizes are available on request. It is priced the same as the other Cykora double-weight papers.

Eastman Kodak Company's "Kodak Wratten Filters for Scientific and Technical Use" new edition is available at Kodak dealers for 75c. This 78-page book is the old standby in a new format with new data on color compensating filters and on dominant wavelengths, purity and stability. Transmittance data is now with the curves of the filters and are no longer together for easy comparison. Most of the characteristic labels have been removed from the curves.

Another booklet issued by them is "Kodak Enlarging Lenses" which carries descriptions of the Ektar and Ektanon lenses at from $44.30 to $127.45.

Kodak offers a thin emulsion, stripping film developed for autoradiography, available in 5 foot rolls of unperforated 35 mm at $8.30 per roll.

Keystone Manufacturing Company, Boston, Mass., offers a light weight Pathfinder, Model K-29 8-mm roll film camera, three speeds and f/2.8 lens for $49.95. Their 8-mm Regal and 16-mm Belmont projectors of 750 watts now contain a built-in splicer and magnifying viewer so that the user can see the film frame by frame during editing. The projector has a provision for switching the room lights off when the projector is turned on and vice versa. They will be available in about 2 months at $169.50.

Kling Photo Supply Corporation, 235 — 4th Avenue, New York 3, N.Y., are importing 2 Balda folding cameras. The Baldalux 120 takes 8 pictures 120 size, or 16 half that size, has a Pronto shutter (1 to 1/350), built-in self-timer, 2 finders, 4 cm. Radionar f/4.5 lens focusable to 3 ft. $49.95, case $6.50. The Baldinette is a 35-mm with Pronto shutter, self-timer, telescopic finder and 2-in. Radionar lens of f/3.5. $49.95, case $7.95. Both have all-metal bodies with leather bellows and the lenses are coated.

They also announce the new Linhof Technika 23 which brings to a 2¼ x 3¼ size the features of the larger sized Linhofs. A cam-coupling device permits use of the rangefinder with any of 3 lenses and the Vari-View finder with a single lens for both range and viewfinders gives a coverage of the lenses and cares for parallelax. Other features include: triple extension leather bellows, rising and tilt-back front, drop bed, revolving, swinging and tilting back, leather focusing hood, flask gun bracket, accessory clip and depth of field scale. Press-type cut film holders, film pack adapters, and a roll film holder may be used. Schneider coated lenses are: Xenar f/3.5 105-mm, Angulon f/6.8 65-mm wide angle and Tele-Xenar f/5.5 180-mm telephoto. Price including tax $575.

Lentic Corporation, 2 East 56th St., New York 22, N.Y. announces a six lens camera, special enlarger and mounts to give three dimensional pictures by the lenticular process using plastic screens. All lenses are coupled, synchronized for flash and fitted with a range finder. Roll film of 120 size is used. No price given.

An Exposure Dial Calculator for lens settings from f/1.4 to f/22 at speeds from 0.75 second to 1/200th second using indoor lights is now included free with lights sold by the *Mayfair Manufacturing Company,* 55 Ekford St., Brooklyn 22, N.Y.

Peerless Film Processing Corporation, 130 W. 46th Street, New York 36, N.Y., offer a new process called "Peer-Renu" that they believe will recondition and make possible prints from old films that have shrunken beyond direct use. The treatment is applicable to both 16 and 35 mm films.

Photo-Guide, a pocket sized photographic magazine, published in London, is available from Dept. P.G., *Rayelle Publications,* 5700 Oxford Street, Philadelphia 31, Pa., at $4.00 per year to subscribers in the U.S.A.

The David White Company, Milwaukee, Wis., announce a small stereo viewer called the "Handi-Viewer" for $9.50. It contains built-in light, a focusing knob and matched achromatic lenses.

Speedlight Center, 128 W. 32nd Street, New York 1, N.Y., market the Mighty Midget speedlight that goes around the camera lens and is mounted on a Series VI adapter. Neutral filters can be used to reduce the light for black and white work when necessary. The close-up attachment sells for $29.95. The AC unit is available for $69.95 and a battery pack with self-charger $39.95.

For further information our readers should write direct to the manufacturer mentioning that they learned of the product through this Department of the *B.P.A. Journal.*

Biological Photographs Wanted

Dr. Thurlow C. Nelson, Department of Zoology, Rutgers University, New Brunswick, N. J. wrote as follows: "Can you refer me to any member of the Biological Photographic Association, who might have Kodachromes of microscopic organisms found in lakes and streams. I should particularly like pictures of crustacea, insect larvae and protozoa. I am anxious to purchase a few of these in connection with building my own slide collection in this field."

Suggestions for Contributors

Manuscripts should be sent to The Editor, Journal of the Biological Photographic Association, 70 Alton Road, Stamford, Conn.

Manuscripts must be typewritten, double or triple spaced, with full margins. The original and not a carbon copy should be submitted.

References: References may be given as footnotes or, if numerous, may follow the context. They should be given in the following forms:

Book—Valasek, J. 1949. *Introduction to theoretical and experimental optics.* John Wiley & Sons, N. Y. x+454 pp.

Journal Article—Carman, P. D. 1949. Photogrammetric errors from Camera lens decentering. J. Opt. Soc. Am. 39(11):951-954.

Tables: Tables should be typed on separate pages and should have captions which will explain the data without reference to the text.

Illustrations: Wherever possible illustrations should conform to the following proportions:

Horizontal—the quotient of the height divided by the width should equal 0.7.

Vertical —the quotient of the width divided by the height should equal 0.7.

Full page illustrations should not be less than 6.7 inches by 9.5 inches. Others should not be less than 4.25 inches by 6 inches.

When mounted, illustrations should be twice or three times the page width which is 29 picas, or 4-5/6 inches. Illustrations for the cover should be multiple of 39 picas, or 6.5 inches.

Legends should be typed on a separate sheet and keyed for identification.

Editorial Policy: The Editor will endeavor to cooperate with the author by following suggestions regarding layout where it is feasible. The cost of publication may make it necessary to revise the text and group illustrations. The author will be advised of any extensive changes.

The Editor and the Editorial Board reserve the right to reject any material which proves to be too expensive and/or which they believe to be unsuitable for publication in the Journal.

CONTENTS

22nd Annual Meeting, New York City ---- 50

Wilkinson, P. N., Hoecker, F. E., and P. G. Roofe. Photomicrography of Constant Registry Autoradiograms ---- 52

Meiller, F. H. Paper Negatives as an Aid in Selecting Fields in Photomicrography ---- 59

Book Review: Insect Natural History by Imms ---- 61

Engle, C. E. Report on the Fifth Congress of the International Scientific Film Association ---- 62

LaRue, M. W., Sr. A Portable and Versatile Unit for Photomicrography and Microcinematography ---- 65

Biological Photographs Needed ---- 71

Dragesco, J. Electronic Flash in the Photography of Small Animals ---- 72

Sturgis, W. The Intraflex Body-Cavity Camera ---- 75

Book Review: Horses by Holme ---- 80

Brubaker, J. D. Lens Data Tables and Design Calculations for Open-Tube Endoscopic, Cavity and Close-Up Photography ---- 81

Book Reviews: Annual Report on Stress by Selye; Phase Microscopy By Bennett, Jupnik, Osterberg and Richards ---- 86

Medical and Biological Illustration ---- 87

Association News ---- 88

Chapter News ---- 88

Book Review: Optics by Sears ---- 89

Tuttle, H. B. Preliminary Report on the B.P.A. Membership Drive ---- 90

Fellowship Notice ---- 91

Sustaining and Contributing Members ---- 92

Announcements and New Products ---- 94

Biological Photographs Wanted ---- 96

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Journal of the
BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

Vol. 20
No. 3

V. Y. Yamamoto

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August 1952

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22nd ANNUAL MEETING

of the

BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

HOTEL NEW YORKER

NEW YORK CITY

September 10-11-12, 1952

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All members should have received a compendium of information on the 22nd Annual Meeting, including three pages of data about hotel accommodations, registration, exhibits, New York activities, and the Annual Salon. (If you have not received yours, or wish extra copies, write to the B.P.A. Secretary, Mr. Lloyd Varden.) We expect a record attendance this year, and when we say "record", we mean it! Never before have we secured so many exhibits, nor have we had as good

advance publicity. Never before (say we modestly!) has a Committee worked so hard to give you details of the advantages of coming to the Convention City; most important of all, we are sure we have an outstanding program for you.

Are you interested in Time-Lapse Photography? Mr. Lewis W. Koster and Mr. Mervin W. LaRue will give a joint demonstration of their equipment and technics. At the other end of the scale, High-Speed Photography will be discussed by Mr. Kenneth Shafton. The latest wrinkles in Photomicrography are always in demand: Mr. William Martinsen will talk on Exposure Determination, Miss Avis Gregersen will show how to prepare tissues properly, and Mr. Carl Brinkman will give one of the small-group demonstrations on methods.

Color photography is all-important today: one of the demostrations will concern retouching of transparencies and prints; and the characteristics of types of 16 mm. color films (including negative-positive processes) will be detailed by representatives from Eastman Kodak Co. and Ansco. Biology will not be neglected. Dr. Roman Vishniac will discuss "The Dynamic Approach to Nature Photography", and Mr. James Mahaffey will present "A Correlation between Photosynthesis and Photography."

In the motion picture field there will be a demonstration of the new method for magnetic recording on 16 mm. film, and a dramatic presentation of three-dimensional filming by Mr. Floyd Ramsdell. The Arriflex 16 mm. Motion Picture Camera is to be described, and Dr. H. G. Kobrack will show how he secures his excellent movies of the human eardrum. A third demonstration will be given by Mr. Dwinell Grant, on how to make up simple titles, charts, and animated diagrams for the motion picture camera.

For the scientist wishing to keep up on vital new methods, Dr. Charles Maresh is going to explain "Infrared Microscopy with the Electron Image Converter Tube", and "Spatial Vectorcardiography" will be demonstrated by Mr. Robert Brown. "The Use of the Eye as a Camera" will be one of the more unusual subjects presented, by Mr. Ralph P. Creer. Some of the more general topics coming up for discussion are "Graphic Arts in Science Journalism" and "Photographic Standards in Medical Education". Although we cannot list all of the papers, we should mention a most unusual demonstration, on "Latest Printing Technics in the Darkroom"; an expert will run through processes which are so common that fine points are often taken for granted.

We shall be addressed also by eminent speakers: for the Luncheon, Commander R. A. Noe, U.S.N., and for the Banquet, Doctors Wayne M. Hull and Orin S. Wightman. The NEW YORK COMMITTEE looks forward eagerly to entertaining you, your families, and your friends. This should be our most successful Annual Meeting.

Testing Photographic Lenses with an Extrafocal Screen

JEAN DRAGESCO*

THE modern photographic lens accomplishes some prodigous feats of precision in order to satisfy the increasingly severe requirements of photography and motion pictures on average and miniature sizes. The continuous improvement of emulsion resolving power obliges the designers to recalculate certain lens types in order to increase their resolving power. The requirements of modern photography are also becoming greater and greater, both in the field of chromatic correction (color photography) and in that of larger relative apertures.

Unfortunately, there is now no exact criterion for the safe choice of a desired lens. It is therefore of great interest to have a rapid and easy testing method. Most of the methods used so far are long and complicated (determination of aberrations and measurement of resolving power). The method to be described has the advantage of combing precision with considerable simplicity. If necessary, the test may be done at the merchant's who sells the lenses!

This test, originally by L. Foucault (1850), was revived by V. Ronchi for interference study, and by L. Lenouvel, whose geometric theory is sufficient for the present application. The test was simplified and applied to photographic lenses by J. Texereau. We have used it for a year and are satisfied with it.

A screen with high contrast, opaque lines and clear spaces of equal width is used. The best spacing is 4 to 5 lines to the mm (100 to 130 per inch). One can easily make such a screen by photographing an india ink drawing, figure 1B, or, more simply, by gluing equally spaced, long bands of serpentine white paper onto dull black paper. One should make a square of some fifty equidistant lines.** The final screen is obtained by photographic reduction using a fine grained emulsion with maximum contrast (Process Microfile).

After obtaining a screen, it is necessary to make an artificial star by placing an opaque box with a 1.5 mm (1/16-in) diameter hole in front of a clear, unfrosted lamp so that a part of the filament is visible through the opening. The housing should otherwise completely cover the lamp to facilitate vision.

The test is done in attenuated moving light as follows: The artificial star is placed 4 to 6 m (13 to 20 ft) away and so that the lighting of the hole is

*6 Rue A Samain, Paris 17, France. Translated from the French at the Eastman Kodak Co. and by the Editor.

**Editor's note: Ronchi rulings may be purchased from some dealers in war surplus optics.

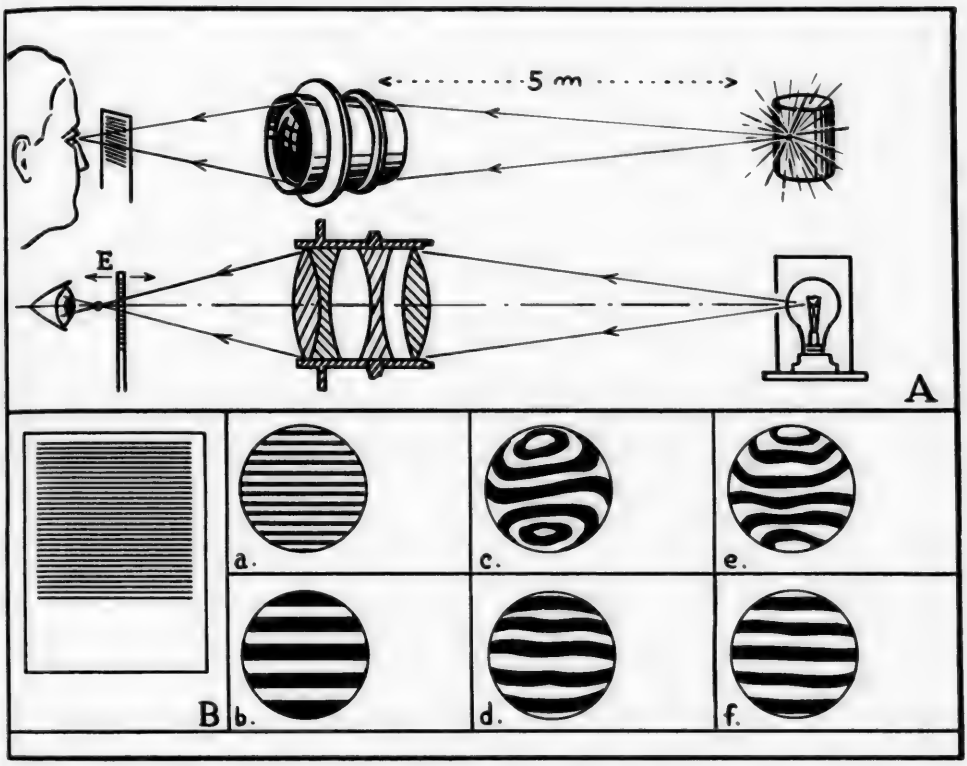


Figure 1A. Diagram of test in perspective (upper) and in section (lower) showing the observer at left, test screen, camera lens, and artificial star at 5 m (16 ft). 1B. Test ruling of screen. Theoretical image of ruling, a, when too far away and b, at proper distance. Appearance with uncorrected lens, c; with average lens, d; a very poor lens, e; and a very good lens, f.

brightest, figure 1A. The lens is then inserted in front of the eye and moved until the lens surface appears to be completely and uniformly lighter (in focus). The lens may be held in the hand, or better in an adjustable support. The screen is then placed between the eye and the lens, preferably on an adjustable support, although it may be hand held. The screen is moved toward the eye until only 4 or 5 dark bands are seen across the lens, figure 1B, b. With short focal length lenses the screen is held close to the eye and may even touch the eyebrows.

If the beam is stigmatic the fringes should be straight, equally spaced, and well marked in black and white, figure 1B, b. Alterations of this theoretical image provide information on the aberrations of the lens being tested.

With chromatic aberration the fringes are iridescent. An excellent modern lens should show only a slight edge of pale orange. A lens with a rather long focal length may show a really red fringe. Older lenses and those of the Tessar

type of over 12 cm focal length often show vivid colors: purple and bluegreen (such a lens is unsatisfactory for miniature photography). A non-chromatized lens shows a small true spectrum.

The aberration of curvature is indicated by a curvature of the fringes, of opposite sign, according to whether the screen is between the image and the lens (intrafocal), or between the image and the eye. The first position is preferable, because it allows a much closer approach to the intersection of the rays. Spherical over-correction appears as barrel-like fringes and under-correction as pincushion fringes. One can quantitatively assess the seriousness of the defect by relating the amount of curvature of the fringes to their separation. One may consider the lens good when the fringes do not depart from straight lines by more than a tenth of a step. One may, in fact, easily obtain test photographs by placing a camera in place of the eye. The lens of the recording camera should be fully open, its focusing matters little.

Most photographic lenses show fairly large spherical aberrations, particularly those of long focal length. Those of the Tessar type generally have under-correction at the center and over-correction at the edge and a neutral zone at about 0.7 of the radius, figure 1B, d, and do not improve by diaphragming; also the focus is not the same with a large as with a small opening. Other lenses reveal a considerable aberration at the edge, but are stigmatic at the center (at about f:8).

Finally, when the lens of an objective has a local refractive defect, a stria or a cord for example, the fringes are stepped and barred in a curious and surprising manner.

The extrafocal screen test is very simple and allows the relatively complete study of a lens in about ten minutes. In our opinion, it renders great service to all practising photographers. However, it must be said, that the test is only valid on the optic axis. One can also study the aberrations outside of the axis, but the interpretation is more delicate. It should be supplemented with test chart photographs when the lens covers a considerable field (from about 45°).

***The Year's Photography,* 1951-52, The Royal Photographic Society, London, 1951, 108 pages, bound, 8 s. 6 d.**

This is the 96th volume of the well known Year's Photography, representing a review of the annual exhibition of the Royal Photographic Society. The publication contains over one hundred black-and-white and color illustrations and reviews on pictorial prints, nature photography, color photography, scientific photography, radiography, medical photography, etc. A number of interesting biological and medical photographs are reproduced in the volume.—L.E.V.

Lens Data Tables and Design Calculations for Open-Tube Endoscopic, Cavity, and Close-Up Photography, Continued

J. D. BRUBAKER**

Outline Of First Steps In Design For Open-tube Endoscopic Camera Lens Arrangement

(1) By temporary photographic tests (using a wooden mock-up holding essential optical parts and simulated endoscope)* get accurate estimate of light level on the field, by photographing a suitable target.

(2) Choose tentative best magnification.

(3) Calculate lens focal-length needed for the lens-field distance at that magnification.

(4) Check entrance pupil diameter to see if it can be made smaller than the diameter of tube through the mirror.

(5) If these factors do not check out to a good common-sense design, verified by experimental exposures, choose a different magnification and proceed to a new trial solution.

The method for designing equipment for cavity photography is similar, but the maximum entrance pupil diameter and tube diameter through mirror in this case is not restricted by an open-tube endoscope.

A Typical Design

The following shows the approximate technical data for a typical open-tube endoscopic camera design:

Experience[3,4] indicates that the effective light-level (with internally polished open-tube endoscopes) from a No. 50 flash-bulb on open-flash is equal to about

* For example, the straight portion of the endoscope can be represented optically by a straight tube polished on the inside. The proximal portion of the endoscope with a 6 degree taper each side of center, reflects no light, and can be represented by any material. Suitable restricting apertures for the light from the flash-bulb must be placed near the 45 degree mirror to simulate the anticipated camera construction; a temporary 45 degree mirror with hole in it, and a tube, must be used to test the actual obstruction of the tube in the light path to the endoscope.

At small angles of incidence, (less than 3 degrees to the endoscope axis), polished metal is very highly specularly reflective, and the color of the metal does not change the color of the reflected light rays. For temporary work, polished brass is adequate. The endoscopes are electrically nickel-plated inside by the brush-on method, (using a rag on the end of a rod), to prevent oxidation and the resulting roughness of the surface.

** Design and Research Engineer, 805 Greenleaf Street, Evanston, Illinois.
Received for publication December 5, 1951.

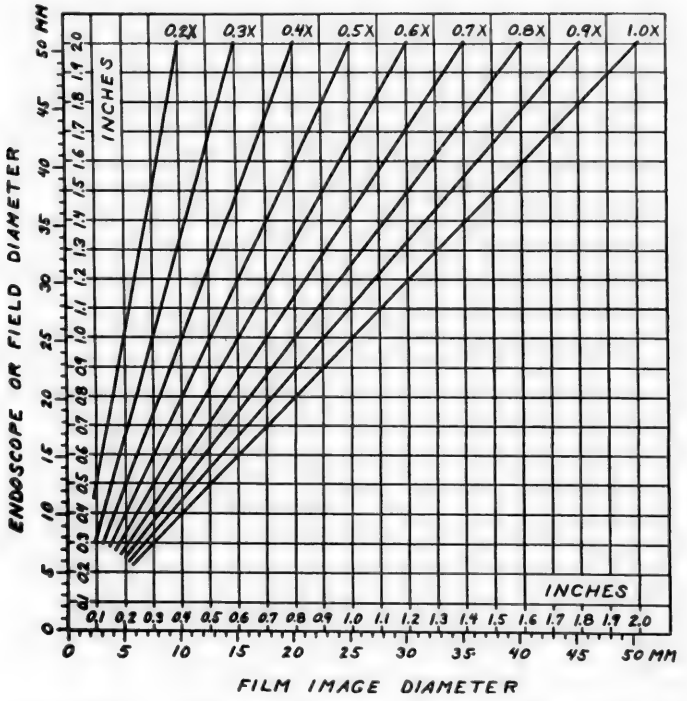


Figure 6. Nomograph. Converts endoscope or field diameter in inches or millimeters to film-image diameter in inches or millimeters for various magnifications.

1000 ft-c for 1/25 second. This light level allows practical designs of still cameras for laryngoscopes or proctoscopes at about 0.7 maximum magnification, with a marked lens aperature of f/11 which is a true stop of f/18.7. The light level of marked lens aperture of F/11 which is a true stop of f/18.7. The light level of f/25, giving an adjustment of one stop larger opening than theoretically needed.

The maximum magnification possible for bronchoscopic open-tube endoscopes is about 0.6 when illuminated with the No. 50 flash-bulb with the same f-stops as above. The maximum magnifications noted are the extreme limit for the 2-lens protar focusing system, and a more practical magnification in some instances can be considered to be about 0.1 less magnification than the values given.

In both these examples, the tube through the 45 degree mirror would have an internal diameter of 0.650 inch. The lens focal-lengths would be between 6½ and 7½ inches.

Open-flash (where the total flash duration is used) is preferable to synchronized operation, since the latter wastes some light and off-sync operation risks under-exposure or unpredictable exposure. Automatic open-flash exposures can

Magnification	Lens-Film Distance in Focal-Lengths	Exposure-Time Multiplying Factor	F Stop Multiplying Factor	TRUE F STOP (Stop marked on lens multiplied by the F Stop multiplying factor)			
				F 8	F 11	F 16	F 22
0.1	1.1	1.2	1.1	8.8	12.1	17.6	24.2
0.2	1.2	1.4	1.2	9.6	13.2	19.2	26.4
0.3	1.3	1.7	1.3	10.4	14.3	20.8	28.6
0.4	1.4	1.9	1.4	11.2	15.4	22.4	30.8
0.5	1.5	2.25	1.5	12.0	16.5	24.0	33.0
0.6	1.6	2.5	1.6	12.8	17.6	25.6	35.2
0.7	1.7	2.9	1.7	13.6	18.7	27.2	37.4
0.8	1.8	3.2	1.8	14.4	19.8	28.8	39.6
0.9	1.9	3.6	1.9	15.2	20.9	30.5	41.8
1.0	2.0	4.0	2.0	16.0	22.0	32.0	44.0

Column 3 and 4 are alternate methods of correcting for increased lens-film distance.

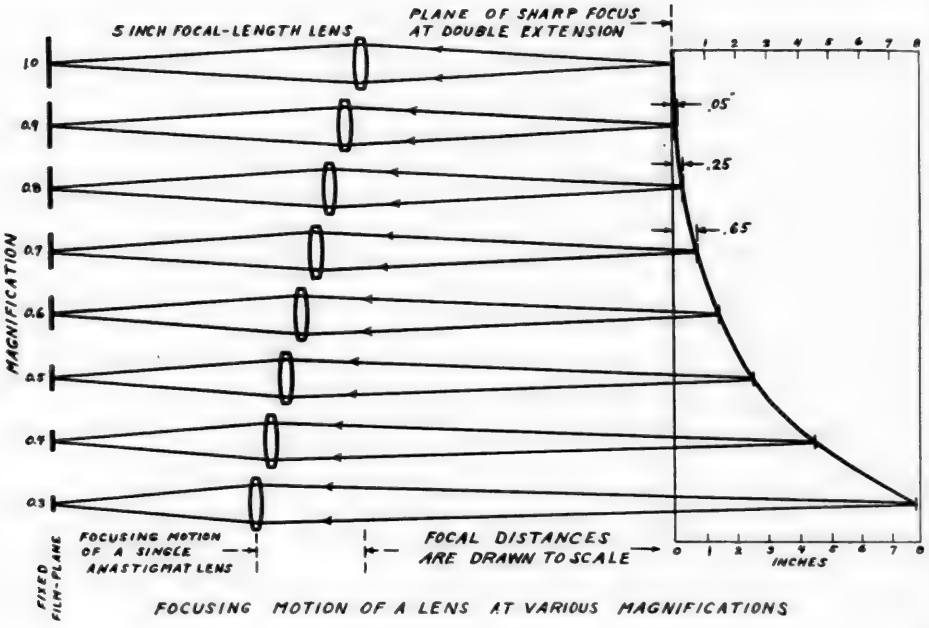
be arranged with focal-plane shutters so that the bulb fires from the "electronic flash" contacts during a slow shutter speed of say 1/25th or 1/10th second.

Choice of Lens Focal-Length

The choice of lens focal-length for open-tube endoscope cameras is affected primarily by: (1) illumination level on the field, (2) lens to field distance, (3) factors which restrict the lens entrance pupil diameter, (4) the magnification possible as restricted by the previous three factors, and (5) depth of field. The degree of magnification affects the lens extension and resultant exposure multiplying factor (true f-stop, Figure 7). The lens-field distance affects the maximum possible light grasp of the lens, since the lens aperture will be larger for short focal-length lenses, figure 4; on the other hand, a larger picture on the film is obtained with lenses of longer focal-length. For a given magnification, the depth of field is independent of lens focal-length. (see axiom 1)

In any specific application — the illumination level on the field, lens-field distance, and tube diameter through mirror, are considered to be fixed — at least temporarily, for calculation of the lens focal-length.

The final choice is the longest focal-length lens which will give proper exposure of the film at an entrance pupil diameter slightly smaller (preferably ½ to 1 stop smaller) than the tube diameter through the 45 degree mirror. This provides the largest magnification possible for a given light level on the field, without running the risk of under-exposure of the film.



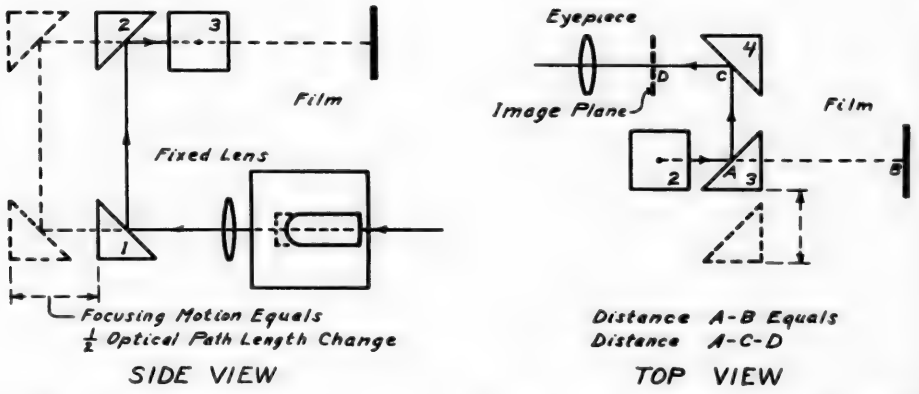


Figure 8. Effectiveness of focusing motion of a single anastigmat lens at various magnifications. B. Focusing by moving two mirrors to change optical path length from lens to film.

The final choice of lens focal-length, entrance pupil diameter (tube diameter through mirror), and magnification, is made by calculating how the several sets of trial data work out best at a series of tentative magnifications, choosing that magnification which seems best, in view of the light level obtained on the field from the illumination method actually used.

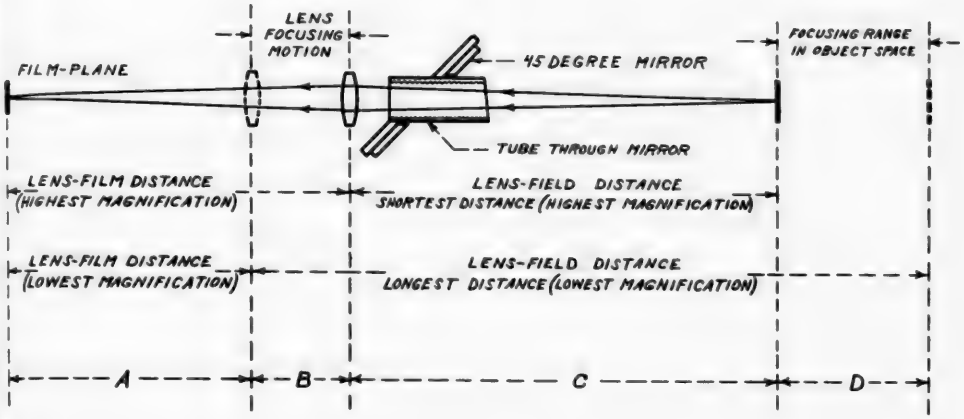


Figure 9. No legend.

Trial Data Calculations

The trial data calculations at various magnifications start with an estimated average light value on the field resulting from test exposures. For example: The Weston exposure meter calculator dial normal arrow set at 1000 with a film speed of 12, shows that a light level of 1000 ft-c at 1/25 sec. would require a true stop of f/25. The marked lens f-stop must be corrected to the true stop to correct for lens extension (marked f-stop multiplied by the f-stop multiplying factor). For example, at 0.6 magnification a marked stop of f/16 becomes f/25.7. In this case, at 0.6X, the entrance pupil diameter of the lens at f/11 should just equal the tube diameter through the mirror in order to have one stop margin of adjustment.

Relative Position of Lens and Focusing Motion

The relative position of the lens, and the methods used to move the plane of sharp focus in the object space deserve careful study; at some magnifications, focusing by knob by ordinary methods is impossible or impractical. Method 3 or 4 is used where method 2 cannot be used at a particular magnification. The magnification changes with the distance focused upon, Figure 8A. Excessive range of focus adjustment may sacrifice magnification unnecessarily, Figure 9. In the following discussion there are four methods described.

Method (1). The equipment is assembled with fixed focus with the object plane of sharp focus a fixed distance ahead of the endoscope tip.

CONJUGATE FOCAL DISTANCES IN TERMS OF LENS FOCAL-LENGTHS

Magnification	Lens-Image Distance	Lens-Field Distance	Magnification	Lens-Image Distance	Lens-Field Distance
.01	1.01	101.00	.51	1.51	2.96
.02	1.02	51.00	.52	1.52	2.92
.03	1.03	34.33	.53	1.53	2.89
.04	1.04	26.00	.54	1.54	2.85
.05	1.05	21.00	.55	1.55	2.82
.06	1.06	17.66	.56	1.56	2.78
.07	1.07	15.29	.57	1.57	2.75
.08	1.08	13.50	.58	1.58	2.72
.09	1.09	12.11	.59	1.59	2.70
.10	1.10	11.00	.60	1.60	2.67
.11	1.11	10.09	.61	1.61	2.64
.12	1.12	9.32	.62	1.62	2.61
.13	1.13	8.69	.63	1.63	2.59
.14	1.14	8.14	.64	1.64	2.56
.15	1.15	7.67	.65	1.65	2.54
.16	1.16	7.25	.66	1.66	2.51
.17	1.17	6.88	.67	1.67	2.49
.18	1.18	6.56	.68	1.68	2.47
.19	1.19	6.26	.69	1.69	2.45
.20	1.20	6.00	.70	1.70	2.43
.21	1.21	5.76	.71	1.71	2.41
.22	1.22	5.55	.72	1.72	2.39
.23	1.23	5.35	.73	1.73	2.37
.24	1.24	5.17	.74	1.74	2.35
.25	1.25	5.00	.75	1.75	2.33
.26	1.26	4.84	.76	1.76	2.32
.27	1.27	4.70	.77	1.77	2.30
.28	1.28	4.57	.78	1.78	2.28
.29	1.29	4.45	.79	1.79	2.27
.30	1.30	4.33	.80	1.80	2.25
.31	1.31	4.22	.81	1.81	2.23
.32	1.32	4.12	.82	1.82	2.22
.33	1.33	4.03	.83	1.83	2.20
.34	1.34	3.94	.84	1.84	2.19
.35	1.35	3.86	.85	1.85	2.18
.36	1.36	3.78	.86	1.86	2.16
.37	1.37	3.70	.87	1.87	2.15
.38	1.38	3.63	.88	1.88	2.14
.39	1.39	3.56	.89	1.89	2.12
.40	1.40	3.50	.90	1.90	2.11
.41	1.41	3.44	.91	1.91	2.10
.42	1.42	3.38	.92	1.92	2.09
.43	1.43	3.32	.93	1.93	2.08
.44	1.44	3.27	.94	1.94	2.06
.45	1.45	3.22	.95	1.95	2.05
.46	1.46	3.17	.96	1.96	2.04
.47	1.47	3.12	.97	1.97	2.03
.48	1.48	3.08	.98	1.98	2.02
.49	1.49	3.04	.99	1.99	2.01
.50	1.50	3.00	1.00	2.00	2.00

Note: The data also may be applied to magnifications of more than 1.00 by transposing the distances in the table, and using the reciprocal of the magnification. For example: a magnification of 0.50 becomes 2.00 (1/0.50) when the figures 1.50 and 3.00 are transposed to 3.00 and 1.50.

Figure 10.

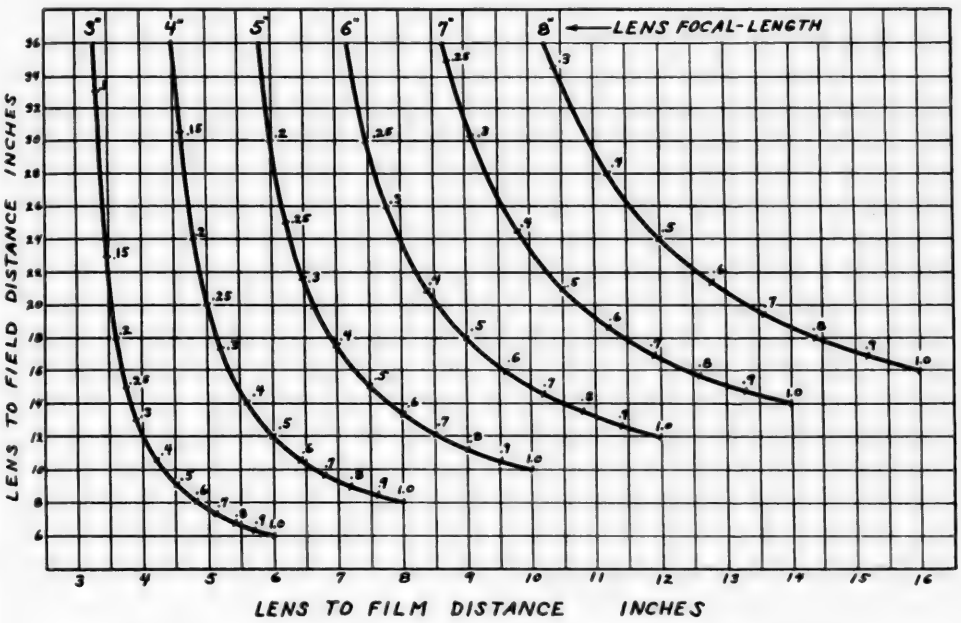


Figure 11. Conjugate focal distances. Magnifications are marked on curves.

Method (2). By means of a knob and rack and pinion, a single anastigmat lens is moved closer to or farther from the film plane in order to move the plane of sharp focus through a suitable distance at the endoscope tip, and to accommodate different length endoscopes, Figures 9, 8. The magnification constantly changes throughout the focusing range, Figure 8A. The greater the focusing range, the greater will be the difference in magnification at the extremes of the range.

Excessive focusing range increases the average lens-field distance, and for a fixed tube diameter limits the lens to a shorter focal-length with consequent lower magnification and smaller picture on the film. Figure 9 shows how the focusing motion (distance B) of the lens is added to the lens-field distance at long endoscope distances and at the lowest magnification.

This method is the most suitable for magnifications between 0.2 and 0.6; possibly up to 0.7. At 1.0 this method is impossible.

Figure 8A shows how the focusing range adjustment distance becomes reduced for each 10% magnification nearer to 1.0 (double-extension). Between 0.8 and 1.0, the focusing effect in the telescope or focuser eyepiece is so very indecisive as to be practically useless; the focusing range covered is so short that it is of little practical value. In figure 8A, the conjugate focal distances are drawn to scale.

It is impractical to move the film and eyepiece image planes together in order to focus, (as is done on view cameras at double extension by moving the back, with

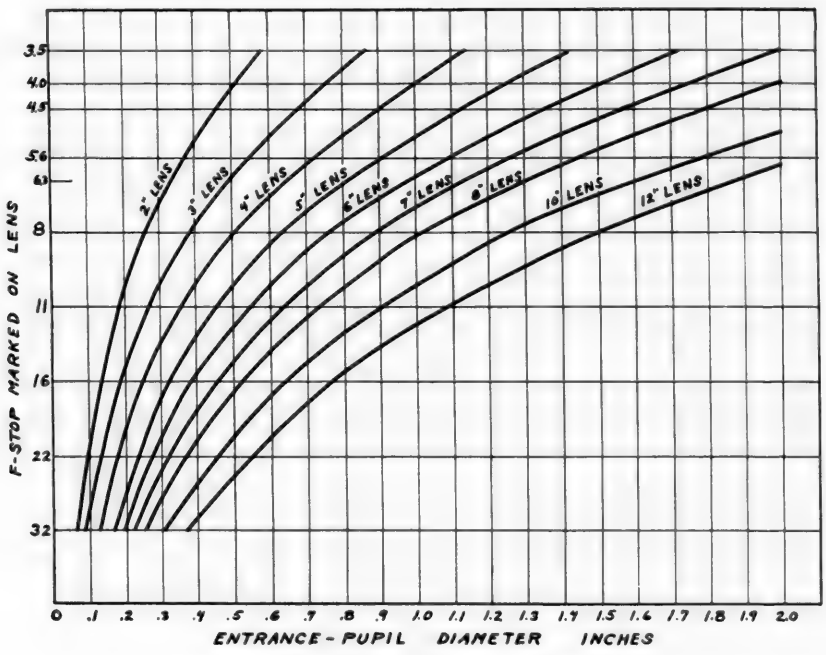


Figure 12. Entrance Pupil Diameter.

the lens stationary). Therefore these limitations for a single anastigmat lens with rack and pinion focusing are unavoidable.

Method (3). A focusing method somewhat similar to moving the view-camera back uses a pair of moving mirrors in order to change the lens-film optical path length, figure 8B. The lens and film are in fixed positions. The front-surface mirrors, 1, 2, 3, 4, comprise a Porro erecting system for the focusing telescope. Mirrors 1 and 2 are mounted together and move simultaneously with a knob to change the optical path length from lens to film plane. The two mirrors produce on the film an exact and laterally correct image, in proper relationship to the emulsion side. Mirror 3 is moved out of the way just before the picture is taken. About 12 to 15% of the light is lost at each mirror reflection when the aluminum coating is new. The optical path length would be varied from about 11 to 13½ inches when using a 7½ inch focal-length lens. The magnifications with the 7½ inch lens would exactly equal those of the 2-lens Protar system. This basic method can be used at any magnification, and is a more satisfactory design, from the standpoint of the telescope eyepiece position and total camera length, than the 2-lens Protar system. It makes a compact camera about 8 inches long.

Method (4). A good method having many possible applications is to use two fully corrected anastigmat lenses as a combination; the spacing of the lenses is

$\frac{1}{2}$ DEPTHS OF FIELD

FOR LENS OF ANY FOCAL-LENGTH. CIRCLE OF CONFUSION=.002 IN.

$\frac{1}{2}$ Depths of field are the near and far depths (inches) from plane of sharpest focus*

Magnification	F3.5	F4.5	F5.6	F8	F11	F16	F22	F32
0.1	0.78	1.00	1.22	1.78	2.45	3.55	4.80	6.90
0.2	.21	.27	.33	.48	.66	.96	1.30	1.88
0.3	.11	.13	.16	.23	.34	.49	.63	.88
0.4	.06	.08	.10	.14	.19	.29	.39	.58
0.5	.04	.05	.07	.10	.14	.20	.27	.38
0.6	.03	.04	.05	.07	.10	.14	.17	.27
0.7	.02	.03	.04	.06	.08	.11	.15	.22
0.8	.02	.02	.03	.04	.06	.09	.12	.17
0.9	.02	.02	.03	.04	.05	.08	.10	.15
1.0	.01	.02	.02	.03	.04	.06	.09	.12

*This table was calculated by the approximate method, since the near and far depths are very nearly equal at these magnifications. The error is less than 20% for 0.1 magnification. The other tabulations are in error less than 10%. An accuracy within plus or minus 10% is sufficient for practical purposes.

Figure 13. No legend.

changed to alter the combined focal-length. Thus focusing is done by a continuous change in effective focal-length, (7 to 8 inches) throughout the focusing range of 7 inches in the object space. A pair of convertible Protar lenses (35 and 29cm focal-length, each lens being made up of 4 elements cemented together) is suitable for this method and for all magnifications including 1.0 The rear lens is moved back through a distance of 3 inches by a knob. This method makes the total camera length several inches shorter than method 2, for a given magnification, and keeps the magnification up at the longer endoscope distances.

The diaphragm can be placed immediately behind the front (35cm) lens of the pair. (The maximum aperture would be f/11). Theoretically it should be placed at the second principal point of the lens combination; the diaphragm would need to be moved back through about half the distance traveled by the rear lens (29cm). However, from actual examination of the image at the film plane, the diaphragm in a fixed position behind the front lens is entirely adequate and practical, since the degree of vignetting is not detectable; this is because the image diameter is very small in relation to the lens-film distance. Additional data on this system is given in the appendix. (Also see Typical Design.)

Tables and Graphs

The tables and graphs, figures 10, 11, 12, 7, 13, are of value primarily for still cameras. They are also of value in calculating lens focal-lengths for motion

picture cameras. The chief difference is that motion picture cameras usually require lenses of shorter focal-length, larger aperture, and at a lower magnification.

The combined set of tables and graphs given here is indispensable for an adequate detailed study of this field of close-up photography. Most of the tables and graphs are directly related to magnification. A tentative choice of magnification is the pivotal point from which a trial solution can proceed in the simplest manner.

The table, figure 10, and graph, figure 11, contain the conjugate focal distances for each magnification. The table gives them in terms of lens focal-lengths. The *conjugate focal distances* are the pairs of *lens-field distance* and *lens-film distance* for each magnification. The actual distances are obtained by multiplying the figure given in the table by the lens focal length in centimeters or inches. The graph is very useful in choosing a tentative approximate magnification with a lens of a particular focal-length, for a fixed lens-field distance (also see figure 6). More exact calculations then can be made from the table if necessary. The graph may be used for focal-lengths not shown. For example, data for a 10 inch focal length may be obtained from the 5 inch curve, doubling the distances; the magnification remains the same. Data for a 2 inch focal-length likewise can be obtained by using the 4 inch lens curve, and dividing by 2.

The table is calculated for a simple thin positive lens. Small corrections to the total field-to-film distance may be necessary to compensate for the added optical thickness of most photographic lenses (distance between first and second principal points).

Entrance Pupil Diameter

The entrance pupil diameter ([9] pp. 18-20) is the mechanical diameter of the round bundle of parallel light rays which enter the front face of a lens and pass through the diaphragm. It is directly proportional to the lens focal-length for any particular f-stop. The entrance-pupil diameter of any lens is given by: Focal-length of lens/f-stop number. The f-stop number is the number engraved on the lens mount and the entrance pupil diameter is not affected by the corrected true f-stop due to bellows extension.

The entrance pupil diameter may be accurately estimated by measuring the apparent diameter of the diaphragm opening at the front face of the lens, observed from a distance of about 18 to 24 inches.

This diameter is required in order to calculate the tube diameter through the 45 degree mirror when proximal coaxial lighting is used, for the open-tube endoscopes, or for cavity or close-up photography. Or, conversely, witht a fixed tube diameter, choose the focal-length of lens which has a suitable entrance-pupil diameter at the f-stop required by the illumination level on the field.

True F-Stop

The table of true f-stops (figure 7) facilitates trial calculations at various tentative magnifications so that the highest possible magnification can be obtained. The true stop is the practical way to correct for lens extension in the calculations, when the open-flash exposure method is used (fixed exposure time).

Depth of Field

Between 0.2 and 1.0 magnification, the depth of field ([8] pp. 74-93) does not change rapidly enough to be the deciding factor of *magnification versus depth-of-field.* The size of picture (magnification) on the film is the most important factor, the resultant depth of field is left to come as it will, since the depth usually is adequate for most endoscopic areas taken through endoscopes.

The table is for a critically sharp image with a maximum circle of confusion on the film of 0.002 inch (0.05mm). The value of 0.002 inch is about the sharpest practical image on modern color film such as Kodachrome (theoretically it is possible for the film to resolve an image with a 0.001 inch circle of confusion under ideal conditions.)

The Following Axioms Are An Additional Guide In The Choice Of Lens Focal-Length

(1) *Lenses of all focal-lengths* at the *same taking f-stop* and the *same magnification* have *equal depth of field.* Therefore the lens focal-length can be chosen to make the *lens-field distance the most convenient* for a given magnification. ([8]pp. 90, 93)

(2) The entrance-pupil diameter should be considered since an f/6.3 lens might be used at only f/11 or f/16, and the hole or tube through the 45 degree mirror need only clear the mechanical diameter of the actual working entrance pupil on the specific lens.

(3) The entrance-pupil diameter should not be larger than the proximal portion of an open-tube endoscope, or larger than the aperture of a cavity photographed, or the image will be vignetted.

(4) Due to the shallow depth of field when working between 0.2 and 1.0 life-size image on the film, the highest possible level of illumination is necessary to keep all parts of the field reasonably sharp on the film.

(5) Coaxial proximal illumination is usually necessary with open-tube endoscopes, and in some cavity work, to avoid shadows on the field and uneven illumination over the field.

(6) When working near 1 to 1 ratio in cavity work, the lens should be fixed in relation to the film, and the whole camera assembly should be moved in order to bring the field into focus[7]. If the lighting system operates by way of a 45 degree mirror ahead of the lens, then the illumination distance and light intensity on the field is always at a precalibrated distance when the field is in focus; thus the exposure values are predictable under these conditions where all of the camera and lighting parts are mounted on one movable base (figure 1).

(7) When it is desired to photograph at a fixed magnification, the foregoing procedure should also be used, with the lens-to-film distance fixed on a calibration mark. Thus at any fixed calibrated maginification, the exposure values are predictable, as based upon the experience with test exposures.

Theory of Illumination

In still cameras for open-tube endoscopes the maximum light at the endoscope tip is obtained with a large diameter No. 50 flash-bulb on open-flash. The bulb acts theoretically like a disc source of light; reflectors or condenser lenses are of little value, the direct rays from the bulb by way of the mirror providing the most light, with the rays entering at a small angle to the endoscope axis[5].

The condenser lens system ([8] pp. 178, 179) in motion picture cameras is limited to a fixed effective f-value for the conditions imposed by the camera design and proximal part of the endoscope. The opening at the endoscope flange in past designs is 1.7-inch in diameter. The only way to increase the light on the field is to increase the average intrinsic brightness of the 5 mm diameter lamp (source) area; the illumination follows the optical laws of search-lights ([10] p. 534; [11] p. 6). Aspheric condenser lenses would help to some degree, since they would conserve the light scattered by spherical aberration**.

Phosphate type heat-absorbing glass for motion picture work should be used in strips 2 mm thick and about 12 mm wide to avoid breakage, the necessary area of the condenser lens being made of a number of strips. This type of glass (K-48), made by the Kopp Glass Co., Swissvale, Pa., absorbs about 90% of the infra-red heat rays and transmits about 85% of the visible (photographic) light, being much more efficient than most heat-absorbing glasses, and changing the color of the light only slightly.

Illuminating methods for cavity and other close-up photography using coaxial lighting with a 45 degree mirror (figure 1) are not limited by the

** The condenser projects an image of the light source (lamp filament, or arc crater) to the proximal portion of the endoscope. This part of the endoscope is about ¾ inch in diameter and is the beginning of the polished part of the tube which is useful in reflecting the light toward the tip. Spherical aberration wastes light by diffusely increasing the image size of the source beyond the ¾ inch diameter; for fixed conditions, the smaller the image, the more light will be reflected down the endoscope. The aspheric condenser would concentrate the light into a ¾ inch or smaller circle instead of scattering some of it at the margin of a 1¼ inch circle.

foregoing restrictions since there is no endoscope, and the tube through the mirror can be made as large as necessary for the entrance pupil diameter demanded by the available light level. A flash-bulb reflector can be used; it helps avoid the problem of obstruction caused by the tube.

Tube Diameter

In designing the tube diameter through the 45 degree mirror the question arises: How large can the tube be made, in order to increase the entrance pupil diameter of the lens, without unduly obstructing the rays of light from the flash-bulb which are reflected by the mirror into the endoscope?

Within certain limits, the light grasp due to a larger tube diameter increases more rapidly than the per cent of light lost due to the added obstructions; but each case must be examined individually, and an answer arrived at based upon common sense analysis by inspection of approximate trial calculations. If the tube is unduly large, too large a proportion of the illuminating rays are reflected at increasing angles inside the endoscope, and makes exposures somewhat less predictable for pictures taken at increasing distances beyond the endoscope tip.

Choice of Magnification

The magnification ratio determines the degree of sharpness with which fine detail of the field photographed will be recorded on the film. Secondary to this is the *actual size of image* on the film which is determined by the *endoscope or field diameter.* (See figure 6 for nomograph to correlate field size photographed, and available film area in camera with magnification.)

If the original film is subsequently to be copied and enlarged for projection and other uses, the original size of image taken by the camera can be designed to be at a *lower magnification* in order to *increase the final effective depth of field.* The original image can be between ¼ and ½ inch in diameter, and if possible, not less than ⅜ inch diameter.

Equipment for cavity photography can produce larger pictures since the field often is much larger than is photographed through open-tube endoscopes. The maximum magnification possible is dependent in part upon the ratio of available film-aperture height to field diameter (see figure 6).

While it is desirable to obtain as large a picture on the film as possible, — so that the original film may be projected as a lantern-slide with the usual 5 inch focal-length projector lens, — this goal is only relative. A shorter focal length lens of perhaps 3 or 3½ inch focal length can be used if necessary with the smaller pictures to give the projected image the correct perspective and size on the screen.

In a permanent catalog of endoscopic still color films the original usually is valuable and sometimes irreplaceable. Therefore it is desirable to make enlarged color copies for use and projection, and retain the original intact as a master film from which more copies can be made[6].

Originals smaller than ½ inch image diameter are sometimes likely to present a very difficult problem in relation to dust, scratches and other tiny mechanical defects, and all pictures should be taken with a diameter larger than ⅜ to ½ inch where practicable.

A high grade simple magnifier such as the Hastings triple-aplanat 7X is necessary in order to judge the exact sharpness of smaller endoscopic transparencies of ¼ to ½ inch in diameter. The focal length of magnifiers should be longer for larger diameters; (5-inch for a ¾-inch diameter image).

To judge the perspective effect of projection, the transparencies can be examined in the same manner as when using a magnifier, using the projection lens (3-in. or 5-in.) removed from the projector as a hand magnifier. The magnification appears the same as when the transparency is projected.

Appendix

Best Lens Position

For both motion picture and still cameras designed for photography through proximally lighted open-tube endoscopes, the complexity and difficulties increase with : (1) increasing length of endoscope, (2) the smaller sized endoscopes (less than ¾ in dia. at tip), (3) greater versatility, wherein the same camera is designed for several lengths of endoscopes with consequent requirement of increased focusing adjustment range distance. The optical considerations of versatility in still cameras slightly reduce the maximum magnification possible in the design, consistent with proper exposure, since it places the average position of the lens farther away from the endoscope tip.

The maximum working aperture (entrance pupil diameter) of the lens chosen is determined by the proximal diameter of the working part of the endoscope, and by the internal diameter of the tube through the 45 degree mirror. In past designs this mechanical diameter has been between ⅝ and 11/16 inch (approximately 0.650 inch average). Outside diameter about 0.700 to 0.750 inch (0.050″ wall)

From the standpoint of (1) maximum film image size, and (2) maximum light grasp, — the lens ideally should be down inside the endoscope — a design which has practical value only for proctoscopic cameras. Then follows the axiom that the lens should be as close to the proximal end of the endoscope as is practical, and thus as close to the back of the 45 degree mirror as is practical. The lens could be located inside the tube (figure 7) through the 45 degree mirror, but the f-stop could not be adjusted easily. Single mechanical rings would be needed, one for each stop, like waterhouse stops. A corollary is that from a purely theoretical standpoint focusing should preferably be done by separating the two components of a convertible protar lens pair (or by two moving mirrors), in order to keep the average effective distance of the *second principal point* of the *lens combination-to-field* as short as possble at all times. *This is important since each slight increase in lens-field distance reduces the possible size of image on the*

film, and reduces the entrance pupil diameter as limited by a fixed tube diameter through the 45 degree mirror.

Illumination Level Required

The three examples below are for a fixed lens-field distance and fixed tube diameter through the 45 degree mirror (calculated on the basis of 15 inches and 0.6 inch respectively); the light value required on the field increases rapidly (approx. as the sq. of the magnification). The figures are rounded off to approximate values:

Changing from a 5 inch lens at 0.50 magnification to a 7½ inch lens at 1.00 magnification requires about 6 times the light.

Changing from a 6 inch lens at 0.65 magnification to a 7 inch lens at 0.85 magnification requires almost 2 times the light.

Changing from a 5½ inch lens at 0.60 magnification to a 6½ inch lens at 0.75 magnification requires about 2 times the light.

This shows in a general way the rapid increase in light needed at the higher magnifications. Magnifications approaching 1.0 are obtained only with a loss in depth-of-field. In these cases, at a 15 inch distance, the best lens focal-length is about 6½ or 7 inches.

Light Level from Focusing Lamp

In still cameras, to obtain adequate light for focusing at the taking f-stop, the auxiliary tungsten focusing lamp and condenser should produce a light level of about 40 to 80 ft. cdles. reflected light on the field. This is best obtained from a 10 volt, 7.5 ampere exciter lamp which has a concentrated filament.

Further Discussion of the Two-lens Protar Method

With the two-lens Protar method, the problem of optical alignment of the two lenses in relation to each other is very easy in relation to the accuracy required in aligning the elements of for example a Tessar anastigmat lens. The axes of the two lenses can be displaced laterally as much as 1/32 inch (1 mm) and perhaps more, without affecting the critical sharpness of the image to any detectable degree. This is because each lens is a fully corrected anastigmat within itself, and the image is very small in relation to the lens-film distance. However, the axes should at all times remain parallel within better than ½ degree angle.

The combination of 35 cm and 29 cm focal length Zeiss Protar lenses tested by the author produced star-images (on the optical test bench) at f/11 as small as those obtained from the best modern color-corrected f/4.5, 4 inch precision enlarging lenses —on the order of a 0.001 or 0.002 inch film plane image, of a point at the object plane. Such definition compares favorably with the best lenses, and is entirely adequate for the best quality endoscopic photography.

Lens Testing

A comparatively simple method of checking sharpness of the image formed by a lens at any particular magnification is to use a target illuminated from behind with an opal-glass type enlarging bulb, or by a ribbon filament lamp and condenser. The target consists of a small front-surface mirror (aluminum coated), with a series of parallel lines scratched through the aluminum coating with a new razor blade.

Such lines should be about 0.001 to 0.002 inch wide, and can be spaced at random, ruled by hand, attempting to obtain a few which are spaced about 0.002 to 0.010 inch apart; some of these are selected and marked by arrows. The exact spacing can be estimated by using a 1/100 inch scale and magnifier, or can be measured on a compound microscope.

The image of this target as formed by the lens under test at the wanted magnification is then examined by a 10X or preferably 20X Hastings triplet magnifier, or microscope. The lack of stray light in the dark spaces between the transparent lines shows that the definition is excellent. This test is sufficiently precise to show the broadened width of line in the image due to airy disc effect when any lens is operated at the very small stops such as f/32, 45, etc.

The exact magnification can be measured by setting up a transparent paper target with lines ruled on it exactly 1 inch or 1 cm apart. The image (at what will be the film plane) is measured on a ground glass screen, using a scale or dividers, as observed by a magnifier, the decimal ratio being automatically obtained by using a 1/100 inch scale such as the Lufkin 6 inch No. 2111R or a metric 159 mm scale.

Camera Details and Design

The exact focal length of lens needed is determined either theoretically or by a temporary set-up, similar to an optical bench, so that the *lens-field distance* and *lens-film distance* (conjugate focal distances) can be measured accurately, as well as the exact magnification obtained.

In optical instruments and cameras, the design is first determined by the temporary physical location of the actual optical parts to be used and the case is designed around the optical layout. The exact optical layout is made, using temporary supports, and the relative positions of the parts is measured. Many experimenters make the mistake of designing the instrument box first, and then try to order optical parts which will fit into a pre-conceived design of arbitrary size.

For best results, the visual focusing method should be a specially built telescope which is part of the camera; however, several modern miniature 35mm cameras have direct-view roof-penta-prism erecting and laterally transposing optical systems which may be a satisfactory substitute for use in simple type cameras, except that the magnification of the eyepiece in some cases will be too low; also there is a further exception that the ground glass image may provide accurate focusing, but the ground glass image slightly increases the difficulty of seeing the field while the endoscope is being moved to find the required field. Special bellows type focusing accessories also simplify close-up work with the longer focal length lenses with 35mm cameras.

The hole at 45 degrees, through the 45 degree glass plane mirror used for coaxial lighting, may be cut with a tubular slotted cutter of brass, and No. 100 Aloxite abrasive grain, using the methods shown in books on making optical parts. [13, 14]

The author's method is to use optician's pitch, to cement the mirror (before rear-surface coating with aluminum in a vacuum) to a piece of ½ or ¾ inch thick plate glass. A cover glass made from 2x2 in. or 3¼-in. lantern-slide cover-glass is cemented on the mirror face to avoid chipping and scratches.

The drill press table is tilted to 45 degrees. The work of grinding is slow. One hole may take an hour or more. The drill-press spindle is kept constantly moving up and down, resting on the glass only a second or two, to keep the water and abrasive grain constantly feeding into the cut.

The thick ½ or ¾ inch plate glass is to provide a homogeneous mass of glass for the tool to cut into, and to support the mirror evenly to prevent cracking and chipping.

With No. 100 abrasive grain, the size of hole in the glass is about 0.010 to 0.020 inch larger than the tube diameter of the tool used to cut it. This is sufficient clearance, so that the tool can be the same diameter (or perhaps 0.010 larger) than the tube through the 45 degree mirror.

The mirror should preferably be made of "water-white" plate glass and coated on the back with aluminum by the vacuum process. In endoscopic cameras, the glass should be ⅛ inch thick. For cavity type (larger) equipment the glass should be 3/16 or ¼ inch thick to avoid breakage. Metal mirrors plated with chromium might be useful, but the reflectivity is only about 50 to 60% as against 85% for aluminum[14] on glass, and chromium imparts a blue cast to the illuminating beam.

Front surface mirrors should be flat within about ½ test fringe per inch, and the optically flat glass slides should be flat on each side within about one test fringe per inch.

Making Stray Light

In endoscopic still cameras, the proximal portion of the endoscope is very brightly ligted by the flash-bulb. This ring-shaped light area is projected toward the film plane as an out-of-focus image considerably larger than the circle image of the endoscope tip.

It is desirable to mask off this unwanted image, and to provide for the absorption of this, and other unwanted stray light, arising from brightly lit parts of the apparatus which is imaged laterally beyond the picture area.

The passage of a beam of light through the lens, which is much brighter than the light-beam forming the useful image, does not in itself necessarily fog the image on the film, except in motion picture lenses at apertures of say larger than f/4.5. Ring-shaped stops will trap most of this stray light. In most instances, the effect of very bright stray light entering the lens at angles of 10 to 20 degrees off-axis can be kept at a minimum by using a coated lens and by keeping the lens chemically clean (so no smudge of film is visible by strong transmitted light). Such smudge or dirt, from the theoretical standpoint acts as a secondary source of stray light to illluminate directly the film area, and to slightly scatter the light rays which form the wanted image, thus fogging the image on the film.

The threshold of Kodachrome film is approximately 1/40th of the full exposure value. If a fully exposed image containing a white area requires an exposure of 40 seconds, the white area will not affect the film at all when the exposure time is reduced to 1 second. Thus any stray light of less than 1/40th the main image light will not affect the film image to any important degree.

Prevention Of Possible Sources Of Fogging Light Over Circular Image Film Area

(1) Endoscope. If any part of the polished endoscope inside diameter is smaller than the entrance pupil at the taking f-stop, a narrow ring at the edge of the image is likely to show a slight fogging due to the vignetting effect, in the form of out of focus images in the narrow ring border included within the circular image diameter.

(2) Glass Slide Reflections. The glass slide at the front end of the tube through the 45 degree mirror should be free from smudges or scratches. Its rear face should come within 1/64 inch (½mm) of the tube end, the tube being cut parallel to the glass face. The glass slide should have its plane at about 85 degrees to the endoscope axis. The tube

wall, including depth of thread should be about 1/16 inch (1½mm) thick when a ⅛ inch thick glass slide is used. A thinner wall risks light reflections from flash-bulb toward the lens.

(3) Tube Through Mirror. The tube through the 45 degree mirror must be threaded inside with a sharp V thread, and painted with a thin coat of black paint, to break up reflections which would occur from the cylindrical surface if not threaded. Such reflections from a tube the same (or smaller) diameter as the taking entrance pupil causes a diffuse fog over all, or most of the circular image area, since the tube is very near the lens and is out of focus. For cavity photography where no glass slide is used, the tube should be cut at such an angle that the flash-bulb or condenser lens cannot directly illuminate the interior of the tube.

(4) Bright Light at Front of Camera Due to Flash-Bulb. Fogging due to brightly lit parts of the camera just in front of the glass slide (including the proximal part of the endoscope) is eliminated or almost completely suppressed by the proper design of the tube through the 45 degree mirror and by the proper design of the light trap rings near the film plane. (See item 6.)

(5) Stray Light in Camera Box. A light-tight bellows (1) between the lens and the tube through the 45 degree mirror; or, (2) between the lens and the film box; is not necessary if direct rays through the tube cannot pass outside the lens mount. These rays would reflect inside the camera box to illuminate the rear face of the lens mount. Such reflections can be sufficiently reduced by painting the inside of the camera box black. A bellows is not necessary when a focal-plane type camera is used. The swinging mirror which directs the light to the focusing telescope can be used as a simple shutter for open-flash when a non-focal-plane film box is used.

(6) Light Trap Near Film Plane. Stray light arising from causes (4) and (5) can be effectively stopped by close attention to the design of the camera between the rear position of the lens, and the film plane. The goal here is to form a tubular boundary lined with flat ring-shaped stops to trap all light leaving the lens which would be imaged more than ⅛ inch beyond the largest circular image taken by the camera (for the largest endoscope). The rings should be spaced close together (1 to 1½ inch) near the film plane. They can be farther apart near the lens. Such rings should just clear the light path from largest exit pupil used in the lens, to a circle just larger than the largest image circle on the film (or just larger than the frame diagonal if the camera also is to take full-frame pictures with the same equipment). The wall of the tube containing the rings should not be visible from any part of the lens exit pupil at the taking f-stop.

(7) Coating of Lenses; Lens Aperture and Distance from Film. The distance of the lens from the film and relative aperture have a great deal to do with the necessity of using coated lenses. Where the lens is operated at f/11 or f/16 with true f-stops of about f/16 to f/25, lens coating is of less importance, and with most lenses, it probably would not be possible to see a great difference in results. It is primarily in motion picture photography with lenses of larger aperture, operating at say f/5.6 and larger aperture, that lens coating is the most important because the lens is relatively nearer the film plane with more effect from multiple reflections within the lens, requiring a coated lens for the best results (the larger aperture would cause more stray fogging light over the picture area). In still work, coating is of less importance, although it is desirable on all new lenses purchased. Tessar type lenses for still work are relatively free from any important ghost light images and other causes of fogging light, when operated at small stops.

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Book Review

Photography, its Materials and Processes **by C. B. Neblette and fourteen collaborators. D. Van Nostrand Company, New York. 5th edition, 1952. vii+500 pp. $10.00.**

For twenty-five years this has been a standard book for photographers. Now it is encyclopedic and much of it has been written by experts including our Lloyd Varden. This volume of 33 chapters is primarily on materials and their use, shows the increasing technical progress in the field. Gone are chapters on enlarging and lantern slide making. Instead the emphasis is now on color. With the exception of a few chapters (including Varden's) the rest of the book is made from reference material up to about 1945 or 1947, so that some of it is already out of date. The section on electronic flash, for example, does not mention the new smaller tubes and the convenient voltage doubler circuits. For a student textbook, that it still states that it is, a chapter on the essentials of a good picture would add to the usefulness of the book. While it will probably be rather difficult reading for the beginner, the advanced photographer will find most of his questions answered and no department should be without this remarkably complete reference book.—O.W.R.

Greater Utilization of Teaching Aid Transparencies *

VERLIN Y. YAMAMOTO**

EVERY teaching institution utilizing color transparencies as a visual education medium feels the need for an adequate means of display to supplement projection presentation or for use when projection is either impossible or undesirable. At the Veterans Administration Hospital in Des Moines, Iowa, for example, the need was evidenced by requests from various departments for displays pertaining to their particular fields of interest. The Laboratory Service desired a photographic museum of gross specimens. The Medical Service wanted to cap its weekly grand rounds with an informal conference around an exhibit of photographs illustrating the progress of cases similar to those seen that morning. The Surgical Service was sponsoring a meeting with a visiting speaker and requested a display of transparencies depicting the particular technic used at this hospital for the same condition.

From time to time, our hospital is the locale, and our staff members the host group, for meetings of the county Medical Society. A symposium is planned on a given disease entity and, of course, the guest speakers have their own slides. Transparencies illustrating our own cases would contribute greatly to the interest of the group if they could be attractively arranged in the back of the auditorium. In none of these instances, would projection presentation have been feasible. Each of these requests meant that someone had to scurry about looking for sufficient view boxes and then would have to see that they were all returned to the proper offices after the meetings were over. It soon became plain that suitable illuminators would have to be purchased or constructed to obviate this borrowing and returning nuisance.

Conferences with the chiefs of various services brought out the fact that while we have a valuable collection of material in the files, they were only potentially helpful so long as they remained there and were used only occasionally to illustrate a paper, conference, or seminar. It was felt that in order to more fully exploit the potentialities of this excellent teaching material, a step in the right direction would be to exhibit several panels of well correlated material which could be readily changed on a regularly scheduled basis or as often as circumstances dictated. Incidentally, the public relations effect, if we may be allowed that term,

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**Chief, Medical Illustration Laboratory, Veterans Administration Center, Des Moines 9, Iowa.

Figure 1. Overall view of illuminator unit in use.

of such a display on physicians whom we have had rare occasions to serve cannot be lightly dismissed. When they are thus enabled to see more than one facet of our program at a time instead of thinking in terms of the isolated lantern slide or other single illustration which is prepared especially for them, the reaction is so favorable it can sometimes be as startling as it is gratifying. Accordingly, a convenient room was allocated, and we set about designing an illuminator to serve all these purposes.

In designing the original pilot model, several considerations were outlined and an attempt was made to satisfy as many of these as possible. To list them briefly, the factors which influenced the final design were somewhat as follows. Since 14 x 17 inch bindups are more or less standard, the viewers should be constructed to accommodate this size. Enough illuminator space should be available to adequately present exhibits which would be comprised of more than a single bindup. Provision should be made to temporarily display transparencies which were already bound as lantern slides without the necessity of remounting them into a bindup. The illuminant should be cool enough to preclude the possibility of heat damage to the material. The color quality should be as close as possible to recommended viewing temperature as is consistent with the other factors. It should be easily

Figure 2. Detail view of construction. Left to right, completed section with black paper cut-out mask; section with opal glass removed showing placement of tubes and sheet metal reflector; complete section with lantern slides laid on black cut-out mask.

constructed of readily available materials. The unit should be portable, or mobile enough to be easily moved from its usual exhibit room location to any conference room in the hospital. With these considerations in mind the illuminator to be described was evolved and has proven quite satisfactory, figure 1.

The complete unit comprises two groups of six 14 x 17 inch panels, one is placed in a vertical position with its center at average eye level and the other lies in a horizontal plane with its surface 34 inches from the floor. In use, the vertical series of panels accommodates the 14 x 17 inch bindups, and the horizontal group can handle an equivalent number of bindups or may be employed to display those transparencies which are already in lantern slide form. It is desirable in the latter instance to prepare opaque masks with the requisite number of openings to block extraneous light from the viewers' eyes. Black interleaving paper with which 14 x 17 inch radiographic film is packaged is ideal and readily obtained. When used for displaying both prints and transparencies, one end of the unit is placed against the wall. The back is covered with textured insulation board and wood strips are provided for the easy changing of print displays. (Back of illuminator is arranged to exhibit 16 by 20 inch mounted prints. One end of unit is placed

against wall so both back and front are accessible.) Any number of units may be utilized to present as many illustrations as the size of the exhibit room will accommodate. Because of the dimensions of our particular room, it was decided to make up each section of six panels. Obviously, this may be varied to suit the needs and spatial requirements of the individual institution. (Front cover.)

The physical construction is straightforward and can be executed by any woodworking shop, figure 2. The framing and end members are of ¾ inch pine and plywood. The sections are simply partitioned boxes 5½ inches deep into which the fluorescent lamps are installed. Two tubes are placed in each partitioned space with equidistant spacing between centers and each side. The reflectors are formed from light gauge sheet metal enameled flat white. The surface panel is a sheet of 14 x 17 inch flashed opal glass. It was not considered necessary to provide individual switches for each panel, but each group of panels is separately controlled. Caster mounting provides the desired mobility so that the unit might easily be moved from room to room.

The 3500° K. white 15 watt T-8 fluorescent tube was chosen as the illuminant and represents in our opinion the best compromise between color temperature and low heat factor, physical dimensions, light output, and ready availability. The newer slim-line instant starting fluorescent was considered and discarded because of certain design difficulties its use would introduce to say nothing of its much higher initial cost.

Eastman Kodak Company recommends that the new G-E Photocolor 13 watt T-8 fluorescent with plastic sleeves be employed as a viewing source. So far as we have been able to ascertain this tube is available only in the twelve inch length and as such is rather difficult to adapt to the desired size. The 3500° K. tube is somewhat warmer in spectral emission than the Photocolor but visual tests have not indicated that the relatively higher red content of the light results in an intolerable degradation of blues and greens. If considerable daylite enters the exhibit room, the light may appear too warm. Where this condition exists it may be satisfactorily corrected by substituting the cooler 4500° K. tubes. With the specified dimensions and components surface brightness is very nearly optimum for any normally illuminated room. General lighting in our exhibit room is by fluorescent lamps to a 10 foot-candle level and the surfaces on which prints are displayed are flooded with supplementary incandescent illumination to a total level of 35 foot-candles. This is the recommended standard for print viewing as suggested by the Photographic Society of America.

It is respectfully suggested that the Biological Photographic Association appoint a committee, possibly to work with the PSA and other groups which have already investigated such matters, to study and recommend certain standards for display and viewing devices. Such standards would facilitate the interchange of

material for exhibit and display purposes. They would assure each exhibitor that his particular displays would be shown under similar conditions all along the schedule which would at least approximate the same viewing conditions for which they were originally prepared in his plant. Then too, judging and viewing of transparency exhibits at meetings such as this, could be conducted on a much more impartial plane than is presently possible with the collection of heterogeneous illuminators hurriedly assembled for almost every meeting of this nature.

Grateful acknowledgment is made to Dr. Kenneth R. Cross, Chief, Laboratory Service for implanting the germ from which this illuminator was born and to Mr. Richard W. Fisher, Engineering Officer and his staff to whom credit is due for constructing the unit from our rough sketches.

To summarize, institutions employing color transparencies as a teaching aid require adequate means of presenting the material when projection is not desired or possible. Several factors influencing the design of a suitable viewing device are discussed. A transparency illuminator to meet these needs is described and construction data and specifications are outlined. Finally, a suggestion is made for standardization of this or a similar design to encourage and facilitate, among other things the interchange of transparency material among interested users.

Marking Medium for Glossy Surfaces

ELLA MAY SHACKELFORD BRECKENRIDGE*

WHITE ink, even if fresh and of the best quality, is not satisfactory for use in marking glossy surfaces. In an effort to facilitate easy marking of x-rays, photographic type electro-cardiographs and glossy photographic prints, a small quantity of photographic wetting agent was added to ordinary white ink. This was found to be of some help but the white ink tended to become granular and settle to the bottom.

Miller's BRUSH WHITE is a fine ground emulsified artists water color. Diluted with photographic wetting agent to the desired consistency it becomes a most satisfactory medium for marking glossy surfaces. It does not become granular although should be shaken before use. When it becomes thicker than necessary for easy flowing in an ordinary pen, it may be diluted and it again becomes a smooth medium that will mark on any gloss surface without effort. Finger marks are no longer a problem when you use this medium.

Ordinary Higgins INDIA INK or black drawing ink may also be diluted with a small amount of wetting agent. It should be used sparingly but even a small quantity will give you a black marking medium satisfactory for use on glossy surfaces.

*Veterans Administration Hospital, Houston 31, Texas. Received for publication May 13, 1952.

A Low Power Photomicrographic Camera Built From Parts of a Slide Projector and a Binocular Microscope*

HSI WANG and JAMES DOOMAN**

PHOTOMICROGRAPHY has become such a valuable research tool that there are now available on the market many types of photomicrographic cameras. The standard equipment of them all consists of an extensible bellow mounted on a vertical (or horizontal) rail and a camera shutter. Pictures are, however, taken exclusively with the objective and ocular lenses of a compound microscope. With such an outfit, the lowest magnification possible (using a 30.2 mm objective and 5 x ocular) is about 20 times, which is too high for many purposes. In order to obtain much lower magnifications, accessories chiefly comprising a low power stage equipped with a mirror for reflected light and a condenser, a low power objective and a focussing attachment are usually needed. But a complete outfit of this kind costs approximately $150.00 in addition to the standard photomicrographic equipment mentioned above. We have succeeded in improvising a practical substitute by assembling the lens of a 35 mm slide projector and the base of a binocular dissecting microscope into a unit, which, when coupled with a Universal Photomicrographic Camera, Model U, Gamma Instrument Co., Inc., takes good pictures at a magnification of 4 to 8 times on 4″ x 5″ films. This device costs practically nothing, and is easy to build. The only requirement is the availability of a 35 mm slide projector with a detachable lens-tube and a binocular microscope. Moreover, the "borrowed" parts are not inseparably installed, but each may be returned to its respective instrument whenever desired. Thus, the scheme amounts to a production of a useful tool out of two existing instruments.

We used in this combination the detachable lens-tube of a 2″ x 2″ lantern slide projector (Model AK, S.V.E., Inc.) and the glass stage, together with its entire base, of a Spencer Stereoscopic Microscope (Model 25F). The lens-tube is 4¾″ long and houses an anastigmatic lens, 28 mm in diameter and 4″ focus. The lens and the stage are joined into a functional unit by a piece of metal (Figure 1) fashioned in our machine shop. It consists of a ring into which the lens-tube is inserted and an adjoined arm with a 90° bend. (The ring and arm could very well be one piece, but in our case the two are bolted together.) The

*Journal Paper No. 33, American Meat Institute Foundation.
**Divisions of Histology and Analytical and Physical Chemistry, American Meat Institute Foundation, The University of Chicago. Received for publication May 19, 1952.

Figure 1. The unit for linking the lens-tube and binocular microscope stand. 1/3 ×.

Figure 2. The assembled outfit ready for photographing with Gamma (Model U) basic photomicrographic equipment. 1/5 ×.

Figure 3. Longitudinal section of beef Semitendinosus muscle (Delafield hematoxylin, Weigert's and Van Giesen's, 10 u) taken with the devised camera. 5½ ×.

lower end of this arm is cut and dressed to fit it into the groove provided on the binocular microscope for the focussing rack. Thus it may be moved up and down by manipulating the pinion just as in normal operation of the microscope. The focussing thereby achieved is both smooth and critical. To photograph, the shutter tube of a Gamma Universal Photomicrographic Camera (Model U) is pulled over the lens-tube in the same manner as over the body tube of a compound microscope. The light-shielding ring (part of the standard equipment of Gamma Model U) is used to insure a light-proof system. The object to be photographed is centered on the glass stage, and evenly illuminated by proper adjustment of the sub-stage mirror. A Spencer No. 735 microscope illuminator is a satisfactory source of light; an arc lamp or a high intensity low voltage lamp (6 volt, 5 amp.) is not necessary.

This improvised camera has a magnification range from 4 to 8 times. The resulting pictures are distortion free and of a high quality throughout the range of magnification and are comparable in every respect to those taken with any com-

mercial low power photomicrographic camera. Figure 2 illustrates the assembly ready to take pictures with the Gamma camera, which is not shown. A sample picture taken by it (a longitudinal section of beef *Semitendinosus* muscle, 10 x5½) is shown in Figure 3.

We have described only the general working principle for the construction of a satisfactory low power photomicrographic camera from a projector lens and a binocular stand. With due modification, especially in the focal length of the projector lens and the extensibility of the camera bellow of the standard equipment, one may be able to obtain a much wider range of magnification than is possible with the one we have constructed.

Rochester General Hospital, N. Y.* School of Medical Photography

The school was founded in 1943. The Course in Medical Photography given by this hospital has been approved by the New York State Department of Education and the Veterans Administration for training under the G.I. Bill of Rights.

Faculty

Robert H. Lowe, M.D. Administrator.

Milton G. Bohrod, M.D. Director of Laboratories; Pathology, Orientation, and Professional Adjustments.

Christopher Parnall, Jr. M. D. Assistant Director of Laboratories; Pathology.

John J. Beiter, F.B.P.A. Chief, Dept. Medical Photography; Instructor.

Muriel Daggett, B.S., M.A. School of Nursing; Anatomy.

Constance Lucia, B.S., R. N. School of Nursing; Medical Technology.

Joseph V. Fiore, Ph.D. Chief of Chemistry Division; Photographic Chemistry.

John Gaughan, Instructor. Charles Reiner, Instructor.

Admission

A minimum of high school graduation. One year of college is strongly urged before entrance. Experience in general photography may be substituted for the college work. 2 semesters of high school or 1 semester of college chemistry is required. Physics and general mathematics are highly recommended. The student

*Abstracted from the School Catalog by the Editor with the approval of Dr. Bohrod.

must be physically qualified to carry on his studies. A statement from a physician to this effect is necessary.

Length of Course

The course includes 18 months of didactic and practical work. The starting date will be September 8th, 1952.

Curriculum

Since instruction in medical photography is still in the experimental stage, minor changes in the curriculum are to be expected during the course, usually consisting of additions to the training program. Much of the work is on an apprentice basis where the student participates in the actual conduct of the department, and is assigned such duties as he is capable of performing. The following types of practical work are given through the entire course, but the aggregate time spent in each, calculated on a 40 hour week, is approximately as follows:

1. General Photographic Practice . . . . . 5 months
   Including ordinary dark room technic; lighting; use of meters; exposure; making lantern slides; prints; enlargements; flash, infra-red and other special technics; will vary with the previous training and experience of the student.
2. Clinical Photography . . . . . 2 months
   Preparation and care of patients for photography. General Technic. Special problems in connection with photography of certain regions. Practical demonstrations and repeated practice.
3. Photography of Gross Specimens . . . . . 2 months
   Including the care, preservation and preparation of specimens for photography.
4. Tissue Technic . . . . . 6 weeks
   General technic of embedding, cutting and staining tissues
5. Photomicrography . . . . . 2 months
   General photomicrographic technic; color photomicrography; use of polarized light, dark field, etc.
6. Miscellaneous Topics . . . . . 2 months
   Preparation of medical charts and tables; copying x-rays; principles and practice of projection of slides and films; preparation of materials for conferences and exhibits. In addition, the student will have an opportunity to perform the numerous miscellaneous tasks which a department of photography in a general hospital is called upon to do, either to augment its income or to aid the other departments of the institution in their work.

Classroom Work

Instruction includes assigned reading and quizzes. A written examination must be passed at the end of each division. The following didactic courses are required:

1. Orientation, Ethics, and Professional Adjustments. Lectures by the various members of the teaching staffs of the hospital . . . . . 72 hours
2. Anatomy and Physiology. Lectures and Laboratory . . . . 120 hours
3. Pathology. Lectures . . . . . 15 hours
4. Medical Terminology . . . . . 15 hours
5. General Photographic Theory. Lectures Lab. and Quizzes . . 100 hours
   This includes the physics of light as it applies to photography; construction, use and care of photographic equipment and the history of photography. Much of this section may, with the consent of the instructor, be omitted with the students who have covered these subjects in college or other courses.
6. Photographic Chemistry . . . . . 20 hours
7. The Microscope . . . . . 20 hours
   Construction, use and care.
8. Photomicrography . . . . . 30 hours
   This covers the critical illumination methods; filters as applied to photomicrography; determination of exposure, etc.
9. Fundamentals of Medical Photography . . . . . 20 hours
10. Lectures on General Photography (Guest Speakers) . . . . 20 hours
11. Tissue Preparation . . . . . 12 hours
12. Photo-Clinic . . . . . 75 hours
    Presentation by the students of a pertinent subject
13. Round Table . . . . . 75 hours
    Review of a portion of the current pictures. Discussion of general topics relevant to the department.
14. Annual Thesis. A thesis on an important topic must be worked up during the course and turned in before graduation.

The teaching is so arranged that the bulk of the formal lectures and basic training will take place during the first six months.

General Information

Three weeks' vacation are allowed. The time must be at the convenience of the department and must not conflict with classroom assignments.

All absences must be made up.

$150.00 for the entire Course. This includes all fees such as health fees, and laboratory fees for anatomy and physiology. All photographic material the school deems necessary for successful conduct of the course will be furnished without cost. A list of required books (cost about $75) will be given to the student who will obtain these items. For non-Veterans $50.00 is payable upon acceptance into the school and the remainder upon entrance. If the student is dismissed by the school, for any reason, during the first 6 months the tuition will be refunded. If he withdraws from the course during the first 6 months he will not receive this refund. If he is dismissed or withdraws after the first 6 months he will not receive a refund.

Board and room is not furnished by the hospital. Meals may be obtained at nominal cost in the hospital cafeteria. There is an additional charge for material used for extra pictures the students may want for their collection, contingent upon approval of the Director. White laboratory coats are required and must be paid for by *all* students. These are laundered by the hospital without charge.

The school does not maintain a placement bureau and does not guarantee a position to its gradutes. It does, however, receive requests for medical photographers and it is naturally pleased to refer such requests to its students or graduates, and its makes an effort to choose that one best suited for the particular position. No fee is charged for this.

The hospital maintains a Health Office with a physician in charge for the care of employees and students. For the duration of the Course, students receive free of charge, all medication, medical care and possible hospitalization whenever necessary.

Book Review

Manual of Clinical Laboratory Methods **by Opal E. Hepler. Charles C. Thomas, publisher. Springfield, Ill. 1951. xv+387 pp. $8.50.**

The biological photographer doubling as a laboratory technician will find this book more than usually helpful as each test is stated in general terms and then in detailed step by step directions on how to do it. Only enough interpretation is given to aid the technician, thus saving space often devoted to laboratory diagnosis. The major sections cover urinanalysis, hematology, gastric and duodenal contents, feces, sputum, body fluids, bacteriology, mycology, serology, blood grouping, clinical chemistry, allergy, tissue sectioning, basal metabolism, and electrocardiography.—O.W.R.

Association News

"Cytology Exhibit Wins Top Award" — Second place went to "Fetal Salvage Program — Preconception Treatment Clinic", prepared by Edward C. Hughes, M.D., Charles Lloyd, M.D., Ferdinand J. Schoerneck, M.D., Albert W. Van Ness, M.D., and *Miss Stella Zimmer,* the photographer, all of Syracuse. The exhibit was sponsored jointly by the College of Medicine, State University of New York at Syracuse; Syracuse Department of Health; and New York State Department of Health. From News of the Fifth American Congress on Obstetrics and Gynecology, April 4, 1952.

Lester Walter and *Jerome Schleifer,* formerly of Michigan, have purchased Gilpin's Camera Store, 159 S.E. 1st Street, Miami. They report continuing interest in medical photography and invite members visiting Miami to see them.

Julius Weber, Chief of the Department of Photo Research, Beth Israel Hospital, has been appointed Director of Medical Photography of Medigraphics, Inc.

Oscar W. Richards has organized a 3rd symposium on microscopy to be presented at the September meeting of the American Microscopical Society.

Henry Roger has been awarded The Certificate of Merit by the Freedoms Foundation, Valley Forge, Pa., for a motion picture entitled "Telephone Pioneers."

Ralph Creer is editor for Medical Photography for the American Lecture Series published by Charles C. Thomas. Volumes in the series have been written by *Leonard Julin* and *Lou Gibson.*

Nominating Committee Report

The Committee consisting of Ferdinand R. Harding, Chairman, Louis P. Flory and Maria Ikenberg proposes the following slate for 1953.

President — C. Graham Eddy
Vice President — Warren Sturgis
Secretary — Jane Waters
Treasurer — Albert Levin
Directors: David Lubin, Lawrence Brown and
Chester Reather.

Additional nominations may be made by the Board of Directors or by a group of members as provided by the constitution (*This Journal* 17:94).

Journal Items

Reprints are sold to authors at cost when ordered prior to publication. No copies are kept at the Editor's or Secretary's Offices. Requests for reprints should

be addressed to the Author. When the author's address is not available to a member, the request may be addressed to the Author % the Editor.

Lost copies in the mails should be claimed within three months of the month of issue. Issues a year or more old cannot be traced (or replaced free).

Index to the first 17 volumes. A few copies are available and may be purchased for $1.00. Make checks out to the Association and send the order to the Editor.

Chapter News*

The most important news which your Secretary has to report, is that two brand-new Chapters have joined our official list, bringing the roster up to ten. This growth over the past year should be particularly gratifying to the whole organization, since it indicates that our members are very much alive in their own communities, and means that the work of the B.P.A. is becoming more important, and will receive greater national recognition in the future. The two new groups, designated officially "The Texas Chapter" and "The Upper Midwest Chapter", are helping to span the country, and we give them cordial welcome, as well as congratulating the members who carried through the work of organization in both locations.

The *Texas Chapter* has been meeting unofficially since February, when 33 photographers were addressed by President Eddy at the Veterans Administration Hospital in Houston. A Steering Committee under the Chairmanship of Mr. C. R. Coneway of the Humble Oil Co., got to work on a constitution, and made nominations for officers. In May the proposed constitution was ratified, and the following were elected: Chairman, Mr. L. D. Winburne; Vice-Chairman, Mr. Perry D. Boaz; Secretary, Mrs. Ella May Breckenridge; Treasurer, Mr. R. D. Kolvoord; Delegate, Mr. R. D. MacIntyre. The Chapter was thereafter ratified by the Board of Directors of the Association, and a Charter was granted early in July.

The *Upper Midwest Chapter,* sparkplugged by intensive preliminary work on the part of Mr. Ervin Miller, met on May 24 in Rochester, Minnesota, and comprised a group of 16 medical and biological photographers from the surrounding territory. They elected as officers: President, Mr. Ervin Miller; Vice-President, Mr. James H. Rothenberger; Secretary-Treasurer, Mr. Lardner Coffey. With an approved constitution, they were officially granted a Charter by the Board of Directors.

We are sorry that the *Boston Chapter* was left out of the last report, as it has had a very busy year. Members had a talk by Mr. Kenneth Phelps on "The Use of

*Warren Sturgis, Chapter Committee Chairman, 314 E. 46th St., New York 17, N.Y.

Varigam Paper", and by Mr. Jules Speyer on "The Galileo Microscope", in January and February respectively. In March an interesting tour of Station WBZ-TV was arranged, and a demonstration given of the methods used in televising clinics and surgery from hospitals. In April there was a double feature: "Rapid Processing of X-Rays" by Mr. Lou Chubb of Polaroid Corp., and "Magnetic Soundstrip Motion Picture Film" by Mr. Arno Lamm. At the May meeting Miss Marion Dawes spoke on "Reproduction of X-Rays for Publication."

In April the *Chicago Chapter* heard Dr. William Bloom of the University of Chicago speak on "Phase Contrast Cine-photomicrography of Dividing Cells", and the May meeting, the last of the year, was devoted to "The Use of Color Film Material and Dye Transfer Color Printing". The speaker was Mr. Philip J. Latourneaux, of Color Technique, Inc. At the Chicago Convention of the American Medical Association in June this Chapter was responsible for setting up and manning a booth in the Scientific Exhibit Section showing typical B.P.A. activities. The material was kindly supplied by Mr. Withy, of the Hitchcock Clinic, Hanover, N.H. Chicago members worked hard to make this a success, and deserve much credit, as well as the thanks of the out-of-town members for a party for them by officers of the Chapter during the Convention.

The *New York Chapter* was addressed by Mr. Lester Bergman, of Bergman Associates, in April on the subject "Problems of Color Duplication for Educational Film-Strips and Slides". Dr. Patrick Fitzgerald of the Sloan-Kettering Institute, and Dr. Herbert Bartelstone of the U. S. Public Health Service, explained problems of Radioautography to the group in May, and described methods used in a type of work rapidly increasing in importance. Two members of this Chapter were honored by recent publication of their pictures in LIFE magazine. Dr. Roman Vishniac illustrated an article on Metamorphosis (his second article this year), and Miss Margaret Markham provided fundus photographs which were used to explain a story on Ophthalmoscopy.

The laryngeal camera of Dr. Lewis H. Clerf was demonstrated to the *Northern Ohio Chapter* in March by Mr. Fred Beal. A special exhibit of prints for the Cleveland Dental Society Convention was arranged, and was set up by Mr. David Lubin. Prints were chosen at the April meeting. The May meeting was addressed by Dr. Adelson, of the County Morgue, who discussed the interesting topic, "The Use of Color Photography in Medical Legal Cases".

A salon exhibit demonstrating work of its members has occupied much of the time of the *Philadelphia Chapter* during the past spring. Meetings were ended for the year with a final dinner in June, where plans for making this salon available to interested groups were discussed.

The *Rochester Chapter* has been meeting regularly in the Color Room of the George Eastman House. It is sometimes a wonder to us to see how much ground

this Chapter covers in one evening. For instance, in April the following program was presented: a motion picture on the Bell & Howell Magnetic Recording Projector, plus a symposium on Photomacrography, with talks by Mr. H. Lou Gibson, Mr. John Beiter, and Mr. Lou Quitt on various phases of the subject. In May there was a presentation of Dormitzer Portable and Photogenic Studio Speedlights by Mr. Alden F. Rootes of Marks and Fuller, and this was followed by a demonstration of Speedotron Portable and Heiland Speedlights by Mr. Art Turner of Smith-Surrey, Inc.

The *Southern California Chapter* has held three interesting and varied spring meetings. "Stereo Photography, Equipment and Technics" was presented in April by Dr. Harold Lutes of the H. L. Instrument Co. "Creative Directions in Color Photography" was the subject discussed in May by Mr. Ralph M. Evans of Eastman Kodak Co., and the final meeting, in June, was concerned with an important branch of B.P.A. work which is all too often slighted. Mr. Al Stewart talked on "Flower Photography under Artificial Light" at the Los Angeles County Museum. In addition Mr. Abbott Sydney demonstrated the new Arriflex 16 mm. motion picture camera.

It is planned to include in the next issue of the Journal a complete listing of Chapter Officers for the year 1952-53, as well as a general summary of the highlights and progress in each Chapter during the past year.

Abstract of Motion Picture Committee Report*

The Biological Photographic Association's Motion Picture Committee, with an increased membership, has extended its scope of activities. The Committee will report a wide variety of film activities from as many sources as possible, in place of continuing to limit its report to activities of B.P.A. members, meetings where films were shown, and publications of interest. In addition, a study is being made which will lead to the development of sound policies and procedures governing the exhibition, judging, and recognition by suitable awards of films shown at B.P.A. meetings.

The Committee is composed of:

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You are urged to send any film information which comes to your attention to:

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*Accepted by the Board of Directors April 26, 1952.

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Book Review

The Photography of Patients. **By H. Lou Gibson, F.B.P.A., Charles C. Thomas Publisher, Springfield, Ill. 1952. 118 pp. Illustrated. $5.50.**

This volume of the American Lecture Series* is written for the physician who wishes to produce photographs of patients in his office, and for the beginner in medical photography. Some of the material constitutes an excellent review for the experienced biophotographer. The chapter on Fundamentals contains much advice which could be taken to heart by all doing this work. Probably too much space has been devoted to the use of roll film cameras used on closeups with wire frames to overcome parallax between finder and lens, as roll film cameras are rarely suited for closeup work, regardless of adapters.

The chapter on Lens Properties is good for the advanced amateur, but may be difficult for the beginner to understand. Photographic optics is not well enough understood by most professional photographers and they can profit from this chapter. Lighting and positioning — the section on lighting is appropriate to the private office and occasional use, rather than for large volume routine photography. The chapter is well presented and should help the beginner, although the reviewer believes that other ideas on positioning the patient should be considered. The chapter on Films and Filters is well done. Some sensitometric terms have been used which may confuse the beginner. The Printing Methods and Paper Selection chapter contains an elementary treatment of the subject that could be studied to advantage by many experienced biophotographers. The book, as a whole, is a useful addition to the literature for the beginner.—F. Harding.

* Editor's Note: The monographs on Medical Photography in this series are edited by Ralph P. Creer, F.B.P.A.

Announcements and New Products

Correction. Burroughs Wellcome & Company of London report that the film erroneously attributed to them on our page 63 was produced by I.C.I. The Wellcome Foundation did contribute the films "Venomous Snakes — Medical aspects" and "Tropical Sprue" to the congress.

An *exhibition of medical illustration,* photography and art in medicine, will be held in the House of the British Medical Association, Tavistock Square, London, England, from June 14th to June 28th, 1952.

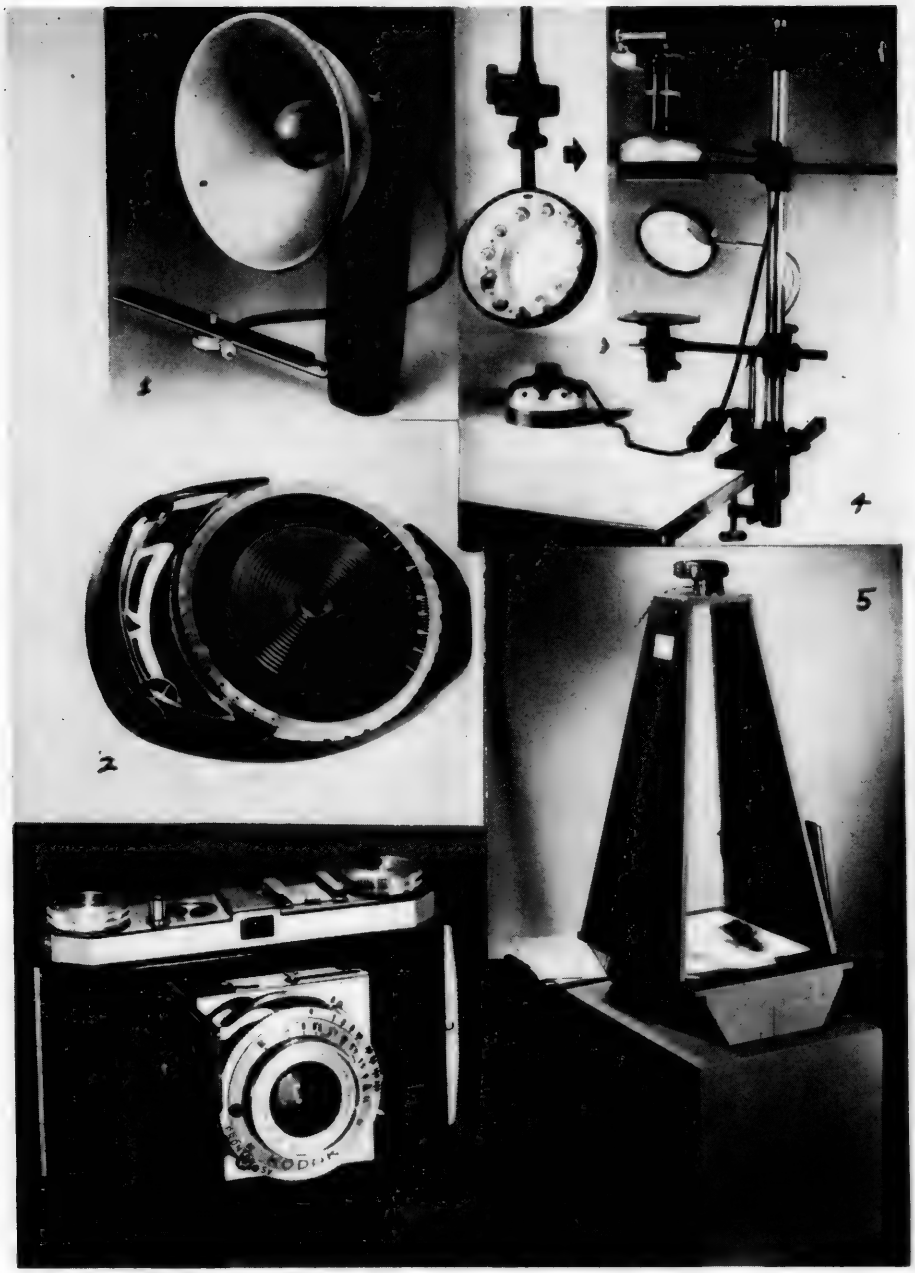
The exhibition is presented jointly by the Medical Group of the Royal Photographic Society of Great Britain and the Medical Artists' Association of Great Britain, and about 300 exhibits will be on view, in addition to selected films.

Sir Henry Cohen, Profesor of Medicine at Liverpool University, will open the exhibition at 3 p.m. on Saturday, June 14th, and Professor H. J. Seddon, of the Institute of Orthopaedics, London, will preside.

The selected films will be shown on Thursdays, June 19th and 26th, in the lecture theatre of Messrs. Ilford Ltd., Tavistock House North, adjoining the exhibition building.

The special issue of the *Photographic Journal* on Photography, in Science, Art and Industry, has been transferred to Section B of the Journal and now includes only science and industry. The March-April 1952 summary of developments in these fields for 1951 includes: theory of the photographic process, diazotype printing, electronics in photography, color correction by masks, cinematrography, chemical control of processing solutions and Medical Photography in 1951 by N. K. Harrison. The Medical Group of the Royal Photographic Society numbers 225 and that of the British Institute of Photographers 197 members. Some 124 photographers have passed the examination and are listed on the Register of Medical Photographers. A brief and well documented summary of the years progress in this field is given that many of our members will find it interesting as about one-fourth of the references are to our *Journal.*

The *Photographic Society of America,* meeting in New York City Aug. 12-16, is sponsoring two symposia and a technical session. The first symposium by Dr. Bohrod and Lou Gibson covers photography in medicine and biology with the aid of a number of BPA members. The second symposium on Photography in Engineering and Science has L. S. Pavelle as Chairman. Allen Stimpson will preside at the Equipment, Materials and Processing session, and K. Pestrekov at the session of papers on Photographic Optics. Our Lloyd Varden is Chairman for the



clinic on Techniques, Materials and Procedures. Nonmembers may attend on paying the regular registration fee. Exhibits, field trips and many other features of interest will be part of the meeting program.

Academy-International of Medicine, 214 W. 6th Street, Topeka, Kansas is preparing a registry of editorial assistants qualified to prepare papers and of technicians qualified to edit motion pictures. Inquiries should be sent to Nathan S. Davis, M.D., Secretary.

Ansco announces a new black-and-white motion picture film Hypan, ASA Index 40, 16 mm 100-ft and 50-ft rolls at $7.35 and $4.25; twin 8 25-ft $2.90.

Ansco announces a new Flash Unit (JN206) with an ingenious adapter for ASA and continental contacts making possible its use with most cameras, figure 1. The plastic unit takes C batteries or a battery capacitor cartridge, has a bulb ejector and a plug-in socket for multiple flash. A quick action locking device attaches gun to mounting bracket, $9.95.

The Copidaptor Co., Suite 301, 1650 Broadway, New York 19, is making a go-between mount making possible the use of a personal camera on any one of 28 different enlargers.

Harold A. Dumont has purchased the 34th Street Camera Exchange, New York 16, and it will now be called *Dumonts 34th Street Camera Exchange.*

Craftsmen's Guild, 1001 N. Orange Drive, Hollywood 38, have added a second lens to their viewer for 23 mm films. $3.50. Pictrol is a calibrated, adjustable attachment for all lenses that controlled soft focus effects, $4.95.

Du Pont 18-F Fixer has an aromatic, oil of lavender derivative to mask the acid and sulfite odors. It is a single-powder, hardening fixer for films and papers claimed to be of long life as well as pleasant to smell. The Du Pont Company is celebrating its 150th anniversary and has published a picture book history relating its growth in relation to the changing American scene.

The *Eastman Kodak Co.* announces a sound track stripping service available thru its dealers for 16 mm films. Sonotrack is a magnetic strip applied for 3.5c a foot (minimum $10) to single perforated film. Kodachrome Film, Daylight type No. 335 is availabel for stereo cameras of 23x24-mm size with standard spacing, $4.75. Processing at Rochester for this year. For an additional $1 or $1.60 (20- or 36 exposures) they will be stereo-mounted.

Kodak announces also a new Retinette camera, figure 3, with Schneider Reomar 50 mm, f/4.5 coated lens, shutter to 1/300 synchronized for M, F, and X class lamps, and with delayed action. Camera with import certificate $59.50. A new x-ray film identification printer is available for $43.75 which prints identification data onto the film before processing for a permanent record.

Kodak presents a new radiograph copying unit with built-in fluorescent illumination and 35 mm camera with an Anaston f/4.5 lens, figure 5. It will take 5 x 7 to 14 x 17 radiographs and with six masks and film positioning is suited to individual copying rather than mass production, $135.

Heitz and Lightburn, 150 W. 54th Street, New York 19, offer the Alpha Macrostat, figure 4, for $82.50 plus tax, which weighs 8 lbs. and can be carried in a brief case. The Annular Lamp shown in the same figure, is controlled by a rheostat and gives shadowless lighting for black-and-white or color film, $55.00. Their imported Rebikoff Color Temperature Meter, figure 2, reads directly in degrees Kelvin and is stated to be accurate from 1.5 to 2.5 percent, $54.00 + tax. In addition two color meters are available from them, the Hilba Color Lux Exposure Meter is designed for professionals and advanced amateurs, $133.50 + tax, and the Swiss Lux 2 which is a light weight (5 oz) compact meter with ASA and DIN scales, $27.00 + tax.

Professional Leica users are now assured a priority repair service by E. Leitz, 304 Hudson Street, New York 13, at regular rates. Leitz can now adapt the 3¼ x 4¼ mirror reflex housing on their Panphote, Aristophot and MA IVb to accept the 4 x 5-in Graflok back for use with Graphic sheet film holders and the Graphic roll film holder.

Morgan & Lester, 101 Park Ave., New York 17, announce the 12th edition of their Photo-Lab-Index. The loose-leaf lifetime edition comes boxed for $17.95 and the case-bound library edition is $10.95. Quarterly supplements $3.00/year. Owners of earlier loose-leaf editions can get the new enlarged binders for $4.50 per volume.

Pavelle Color, Inc., 533 W. 57th St., New York 19, now use a special stabilizing solution to increase the permanence of their color prints.

Photo Research Corp., 127 W. Alameda Ave., Burbank, Calif., announce a forthcoming new Spectra Spot Meter which will measure directly the brightness of a spot of about 1 degree in diameter over a range 1 to 1 million foot-lamberts. The photocell is filtered so that the response matches that of the eye and the power source is built-in. Probable price about $300.

Carl Zeiss, Inc., 485 Fifth Ave., New York 17, offer gratis an 8 page booklet with ASA film ratings, such as is furnished with their new Ikophot II-a photoelectric exposure meter. The exposure meter is a 3½-oz. hand instrument with ASA scales, imported from Germany, $28.00. "Tables for the Contax" including data for all Contax lenses is available from Zeiss for Contax users. New correction lens mounts for view and range finder eyepieces of the Ikon Contessa 35, and Contax IIa and IIIa are available at $1.80 each. The owner can then have his optometrist or optician install a proper lens to correct for his spectacles. Ikoprox paired and coupled supplementary lenses are available for post-war Ikon Ikoflex cameras. They are 1 and 2 diopter lenses for close-up pictures, $12.50 and $15. A Bernotar dual type polarizing filter is also available for $27.50. It is adjustable for 0 to 180 degrees.

Medical and Biological Illustration

April 1952

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The Development of Teaching Models of X-ray Equipment, L. G. Idstrom.

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The Model II Colour Translating Ultra-Violet Microscope, Edwin H. Land.

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Manuscripts must be typewritten, double or triple spaced, with full margins. The original and not a carbon copy should be submitted.

References: References may be given as footnotes or, if numerous, may follow the context. They should be given in the following forms:

Book—Valasek, J. 1949. *Introduction to theoretical and experimental optics.* John Wiley & Sons, N. Y. x+454 pp.

Journal Article—Carman, P. D. 1949. Photogrammetric errors from Camera lens decentering. J. Opt. Soc. Am. 39(11):951-954.

Tables: Tables should be typed on separate pages and should have captions which will explain the data without reference to the text.

Illustrations: Wherever possible illustrations should conform to the following proportions:

Horizontal—the quotient of the height divided by the width should equal 0.7.

Vertical —the quotient of the width divided by the height should equal 0.7.

Full page illustrations should not be less than 6.7 inches by 9.5 inches. Others should not be less than 4.25 inches by 6 inches.

When mounted, illustrations should be twice or three times the page width which is 29 picas, or 4-5/6 inches. Illustrations for the cover should be multiple of 39 picas, or 6.5 inches.

Legends should be typed on a separate sheet and keyed for identification.

Editorial Policy: The Editor will endeavor to cooperate with the author by following suggestions regarding layout where it is feasible. The cost of publication may make it necessary to revise the text and group illustrations. The author will be advised of any extensive changes.

The Editor and the Editorial Board reserve the right to reject any material which proves to be too expensive and/or which they believe to be unsuitable for publication in the Journal.

CONTENTS

22nd Annual Meeting, New York City ---- 98

Dragesco, J. Testing Photographic Lenses with an Extrafocal Screen ---- 100

Book Review: The Year's Photography, Royal Photographic Society ---- 102

Brubaker, J .D. Lens Data Tables and Design Calculations for Open-tube Endoscopic, Cavity and Close-Up Photography, Cont'd. ---- 103

Book Review: Photography by Neblette ---- 121

Yamamoto, V. Y. Greater Utilization of Teaching Aid Transparencies ---- 122

Breckenridge, E.M.S. Marking Media for Glossy Surfaces ---- 126

Wang, H., and J. Dooman, A Low Power Photomicrographic Camera Built from Parts of a Slide Projector and a Microscope ---- 127

School of Medical Photography, Rochester General Hospital, N.Y. ---- 129

Book Review: Manual of Clinical Laboratory Methods by Hepler ---- 132

Association News and Nominating Committee Report ---- 133

Chapter News ---- 134

Motion Picture Committee Report, Abstract ---- 136

Sustaining and Contributing Members ---- 137

Book Review: Photography of Patients by Gibson ---- 139

Announcements and New Products ---- 140

Medical and Biological Illustration ---- 144

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PHOTOGRAPHIC
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Vol. 20
No. 4

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November 1952

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Our Journal—Editorial

Two years ago an emergency left us without an Editor and I took over so that the Journal could continue. This has been a very real, although interesting task. lightened by the cooperation of our officers, members and especially by Mr. Weeks of the Hammersmith-Kortmeyer Company, our publisher. To properly expand and improve our Journal would require more time than I could take from other necessary activities and I asked our Board of Directors to relieve me as soon as a successor could be found.

Lloyd E. Varden, our Secretary, has always been interested in our Journal and once confided to me that he would rather be Editor than Secretary. It is a pleasure to announce Lloyd as our Editor beginning with volume 21 next year.

Lloyd is competent and qualified to be our Editor, being unusually well informed with both your problems and what is going on in the photographic world. He is a practical photographer and has contributed to the progress of photography by invention, teaching and writing.

To all of you — my thanks for your criticisms, kind words and help, best wishes for the Holiday Season and future years.

OSCAR W. RICHARDS

Association News

Leo Massopust, former Editor of our Journal, has illustrated a recent book entitled "Basic Biology of Man" written by Professor Tallmadge of Marquette University.

Phillip A. Conrath has published on "The Importance of Processing" in the May 1952 issue of Hospital Progress and on "Cooperation Between the Doctor and the Medical Illustrator" in the August 1952 issue of the Journal of the Missouri State Medical Association. He gave a lecture at the V. A. Hospital last May on "The Consideration, Application and Evaluation of the Medical Illustration."

Thomas Scanlan sent us the picture of the exhibit at the American Medical Association arranged by the Chicago Chapter used as the cover picture for this issue.

Program of Instruction for Medical Clinical Photographer *

MAJOR FLOYD C. EGGER**

THE profession of medicine has from the earliest times recognized and accepted the graphic arts as an adjunct to the dissemination and preservation of clinical attainments. Marginal sketches and rough block prints are expressive of the attempts of early physicians to rectify the inadequacy of generalities encountered when language alone is employed in a technical field. With the improvements of photography since the middle of the Nineteenth Century, and with recent advances in color processes, the place of drawing in medical illustration has been complemented by photography. Thus the photographer has become important to the dissemination of information on medical subjects and training for this activity must be given greater emphasis.

The need for stabilization and standardization in medical illustration and photography has long been recognized by those who are engaged in the field. Associations and professional societies have been formed for the purpose of fostering ethical standards and exchanging technical data, but for the most part they are limited in membership to those who have, through aptitude and experience, reached professional stature. The needs of those who seek training in the field of photography and other types of art as they pertain to medicine have not been met.

From the earliest days of the Army Medical Museum, later designated the Armed Forces Institute of Pathology, the camera and the graphic arts found their proper place within its walls. It was only natural that with the advent of World War II the Armed Forces Institute of Pathology should be confronted with the formidable task of collecting, by camera and the arts, a wealth of medical illustrative material for preservation and future study. One need only survey the nearly one million items in the Medical Illustration Library to find examples of almost every type of medical or surgical situation known to medical science.

That this material is invaluable and much of it irreplaceable is unquestioned. However, it must also be acknowledged that the value of much if it would be greatly enhanced had the photographer been better versed in the medical aspects and professional requirements of his mission. This must not be interpreted as criticism of the photographer, for time and a state of war did not permit that he be properly indoctrinated and oriented in such a specialized field. The effort to remedy this situation and to provide instruction that will enable the photographer

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to function effectively under unusual or unfavorable conditions has been crystallized in the course of instruction in medical clinical photography at the Armed Forces Institute of Pathology.

The purpose of the course is training; training to qualify the skilled soldier photographer in the application of photographic instruments and techniques to the medical arts and sciences, specifically for the recording of surgical operations, clinical, autopsy, and medical research activities. It is not the purpose of this course to train the student in basic photographic processes. Rather, it is to complement his basic schooling and experience with such indoctrination and technical proficiency as will allow him to advance into the highly specialized field of clinical photography. Therefore, applicants will be carefully screened and only qualified photographers will be accepted.

The course consists of 352 hours of instruction divided roughly into four main categories: academic, technical, administrative, and psychological. Wherever possible, practical application is correlated with classroom theory. The history, development and scope of medical illustration is outlined and the medical fields with which the clinical photographer will be concerned are briefly reviewed.

In outlining the course here, time does not permit each subject to be noted. Therefore, for the purpose of brevity, certain interrelated subjects and phases will be treated as an entity.

Since the medical clinical photographer may be called upon to participate with different units in foreign theaters, as well as within the United States, approximately 16 hours of training are devoted to military organization, administrative procedures, channels of supply, housing and transportation. This will familiarize him with the organization of the units to which he may be attached so that he may function effectively, with complete understanding of his duties and obligations to the unit.

The organization and functions of military government are briefly outlined since the photographer may be stationed with troops on such an assignment. Civilian disease is of great importance to preventive medicine and troop welfare, and while the photographer is stationed in occupied areas he may be able to obtain pictorial records of conditions of clinical significance.

In view of the fact that he may have to cope with adverse climatic conditions, 7 hours of instruction are given to such specific problems as extreme low temperature, high temperature, humidity, and amphibious conditions. Operation of equipment, maintenance and repair, storage, processing, and housing of supplies are discussed.

Many of the productions of the medical photographers are used in training activities. To sharpen his awareness of the qualities which add to or detract from

the educational value of audio-visual aids he is given 9 hours of instruction in the basic principles of educational psychology. It is hoped that even so slight an acquaintance with the subject may influence him to plan his production so that it need not be radically converted to meet the requirements of training.

The physical and biologic sciences are allotted 37 hours of the course. It is not anticipated that more than a basic introduction can be given, but this instruction is designed to provide a foundation for information scheduled later in the course.

Physics is limited to the field of optics and deals with the nature of light wave lengths, focus and focal length, magnification, aberration of lenses and corrective measures, coma, curvature of field, distortion and astigmatism. Electronics offers information on electrical circuits as applied to photography. Color temperature variations as controlled by voltage regulation are explained, and the principles and applications of exposure meters to include calculation of incident and reflected light are presented. Flash synchronization, solenoid adjustment and methods of determining synchronization are demonstrated.

Theoretical aspects and practical applications of sound recording, production, and reproduction are included in this section of the course. The student is introduced to magnetic and disc recording and its basic principles, to loud speaker systems and acoustics, recording techniques, film laboratory processing for sound film, and sound reproduction on film. A study is made of the human ear and its perception of sound as related to production, recording, and reproduction of sound.

The vital part that chemistry plays in almost all photographic processes dictates that the soldier photographer be well versed in this complex science. Accordingly, emulsions and emulsion types including noncolor sensitive, orthochromatic, panchromatic, and infrared are reviewed, component parts of developers and the action of the 4 essential constituents are explained, and the most common effects of temperature changes are discussed. The student is also given a general working knowledge of the action of alkalis, acids and salts.

To one whose association with medical photography has been rather limited, the biologic sciences may prove a new and exciting experience. He is taught to name and recognize the major organs of the human body and important components of the muscular-skeletal system. Basic cell structure, including major cellular classifications, with the location of various cells, is discussed. A brief introduction to pathology is included, with instruction in the recognition of and differentiation between normal and abnormal tissue, as seen in gross specimens, and with elementary identification of granulomatous lesions and tumor cells in microscopic preparations. A brief study of tissue techniques is designed to acquaint the photographer with preferred procedures in staining slides, mounting of tissue sections, identification of common stains, fixing and shipping of gross specimens,

and the sealing and marking of containers. In handling pathologic material of all kinds it is important that the medical photographer be aware of the hazards of infection, and he is taught to exercise proper precautions against possible infection to himself or others.

Bacteriology is also allotted a number of hours in the course. The subject is introduced with a general discussion of the beneficial or harmful effects of bacteria. Examples of certain types are studied in regard to growth and the reactions they evoke, as well as the relationship between disease and bacteria, the human body's resources for the destruction of bacteria and the effects of antibiotics. Mycology is touched upon. Simple fungi, their basic formation, with an explanation of propagating action and germination, preparation of specimens, techniques of culture, culture media, and preferred methods of handling are discussed. Material on protozoology concludes the biologic sciences section, and after a short discussion of free swimming single cell paramoecium, the more common parasitic forms which cause human and animal disease are described.

Before entering into the photographic processes and purely technical procedures of medical clinical photography, a rather extensive study of equipment and supplies is offered to supplement what has been previously discussed. This section is listed simply as "Equipment" and covers instruction in such commonplace requirements as living quarters, protection against theft, vandalism and accidents, dark room lights, water filters, and like generalities.

The major portion of the course, as may be expected, is concerned with the photographic process and interrelated phases. Every effort has been made to assure the soldier photographer of as thorough and comprehensive a foundation as is possible in the one hundred hours of instruction allocated to this subject.

Since the value of the clinical photograph is, for the most part, in direct ratio to the manner in which the subject is photographed, it is appropriate that this section of the course be introduced with study and training in the positioning of all parts of the human body to determine the correct angles and the most effective backgrounds. This is supplemented by a discussion of control, to accentuate subject detail, through selection of proper film emulsions; the character and color of light; the composition of pigments, and finally drawing and the application of color.

The soldier photographer is now ready to move to the outpatient clinic, the hospital ward, and the operating room. Understanding of ward routine, equipment, occupational hazards — both physical and legal — and the importance of establishing a good relationship with ward supervisors and patients are stressed. If he is to work in the operating room, he must know that a plan must be made with the surgeon who will inform him of the important stages of the

procedures to be photographed. Hazards encountered in the operating room are carefully discussed, with emphasis on the explosive and nonexplosive types of anesthesia, the limitation of movement in sterile areas, and the methods of sterile draping of photographic equipment.

Previous instruction in the biologic sciences is now supplemented by a more technical approach to the photography of cultures, gross pathologic specimens, instruments and small objects. Illumination for specific results, magnification, excessive heat, immersion techniques, and contamination are a few of the factors selected for consideration by the student.

Color separation processes and techniques are introduced with a discussion of wave bands, the visible spectrum and its effects upon the rods and cones of the eye. The various methods of producing colored photographs are analyzed, with a consideration of the advantages and disadvantages incident to each. This is combined with practical work in the color photography laboratory to ground the student in techniques and procedures. Every effort is made to equip him with a sound and practical understanding of color and color processes because the medium is becoming increasingly valuable to medical science.

Other photographic subjects in which instruction is offered are endoscopic photography, ultrahigh speed photography, time lapse and cineradiography, high speed cinematography, cinefluoroscopy, animation, and processing techniques.

Two other subjects, not generally considered in this type of instruction, have been included in the course. Television as an aid in medical study has been allotted 10 hours and the medical aspects of atomic warfare, which is particularly timely, is given 12 hours.

In setting up this course of instruction, there was full realization that coverage of every aspect of all pertinent subjects was beyond the range of possibility. It is expected that modifications may be desirable or even necessary in courses for future classes. The course today is offered as a step forward. It is hoped that it may be a firm step.

Unusual Photographs Needed

Professor Gyorgy Kepes, Massachusetts Institute of Technology, School of Architecture and Planning, Cambridge 39, Mass., writes that he wishes to obtain illustrative material for a book entitled "The New Landscape." He is interested in scientific photographs which beside their factual significance possess also a high aesthetic quality. From the prospectus it appears that biological material showing artistic pattern would be desirable. Members having such material should write directly to him.

Care and Upkeep of Cameras *

C. E. BABCOCK**

A CAMERA, according to the dictionary that we have at home, is defined as a vault, or a treasury, along with several other definitions.

Our camera is certainly worth a treasury to us when you consider that it supplies directly or indirectly the money which we seem to need in order to live. We could do lots worse than keeping our camera in a vault. At least it might keep clean there. As long as we are admitting that our camera is an essential part of our livelihood, I wonder how many of us are really acquainted with our wage earner. Let us assume we have just obtained a new camera. The first thing we should do is to take out the instruction book and sit down with the camera and instruction book and then proceed through all the operations on the camera, following the instruction book explicitly. Don't for a minute think that this is a sissy thing to do. I have been working on cameras for over twenty years and every time I pick up an instruction book I learn something new. Most people do not read instruction books but prefer to go by hunch or instinct; as a result repair shops are kept busy showing photographers how to operate their cameras. Putting the camera through a "dry" run as described will give us a feeling of confidence and relieve our minds for the more important matters such as composition, exposure, and subject matter.

Our camera should be handled with care in proportion to the value we place on its results as well as its original monetary value. This means handling it as we would an instrument. Keep it clean, keep it closed when not in use, keep it dry, keep it out of the sun. I believe it is very important to keep it clean. Dust is one of the photographers most vicious Gremlins. You undoubtedly have had experience with dust on your enlarger glass, negatives and prints. The black specks throughout the picture are from the dust on the film when the exposure was made.

Dust throughout the camera causes just as much damage but takes longer to realize what is happening. The dust that settles on your camera and mine are minute particles, with sharp edges, points and corners. These particles, if left to rest on your bellows will saw and scrape every time the bellows is opened and closed. Gradually the bellows creases and folds become worn and then porous. The camera should be cleaned out at least once every six months. Take a clean sash tool, a new one preferably, extend the bellows fully and brush out all the folds all around the outside of the bellows. Use the brush on the track, bed and in

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**Babs Photo Repair Service, 110 Tremont Street, Boston, Mass.

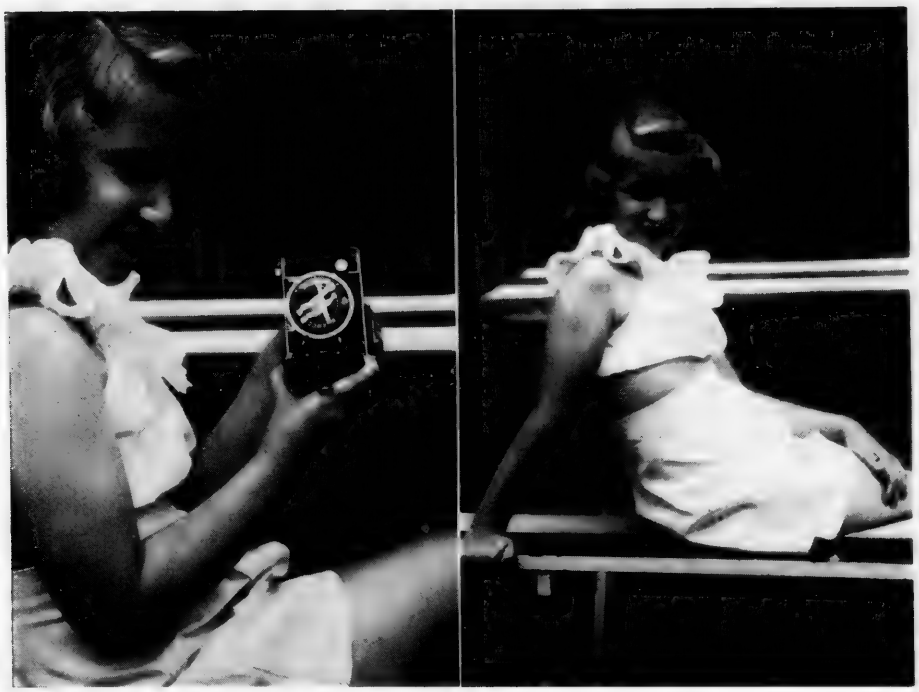

Figure 1. Left. Lens partly covered with adhesive tape.
Figure 2. Right. Picture taken with the camera of figure 1.

the corners of the box as well. Then open the back of the camera, hold the camera so that the dust falls free, and brush out the inside of the bellows. Be sure to get down into the corners and in the lower folds where dust collects rapidly. A small vacuum cleaner would be handy on this job — but be careful to see that the corners of the suction nozzle are not sharp and don't let them rub too much against the bellows.

As you probably know, the dirt, dust or hairs on a lens do not show as dirt, dust or hairs on your negative. I am bringing this out because of the seemingly persistent opinion that dirt, hairs, or spots on the lens will show as such on the negative. So many professional and scientific photographers have told me that a spot or mark on their negative was caused by a spot on the lens, that I began to believe that it could be true. So, I reasoned that if a spot on the lens produces a spot on the negative, then two or three pieces of adhesive tape criss crossed on the front of a lens certainly must produce some noticeable effects on the negative, figure 1. This picture was taken with the tape across the lens as shown in the previous slide, figure 2. Outside of the fact that the picture lacks snap and contrast, there is no evidence that more than half of the surface of the lens was covered by adhesive tape.

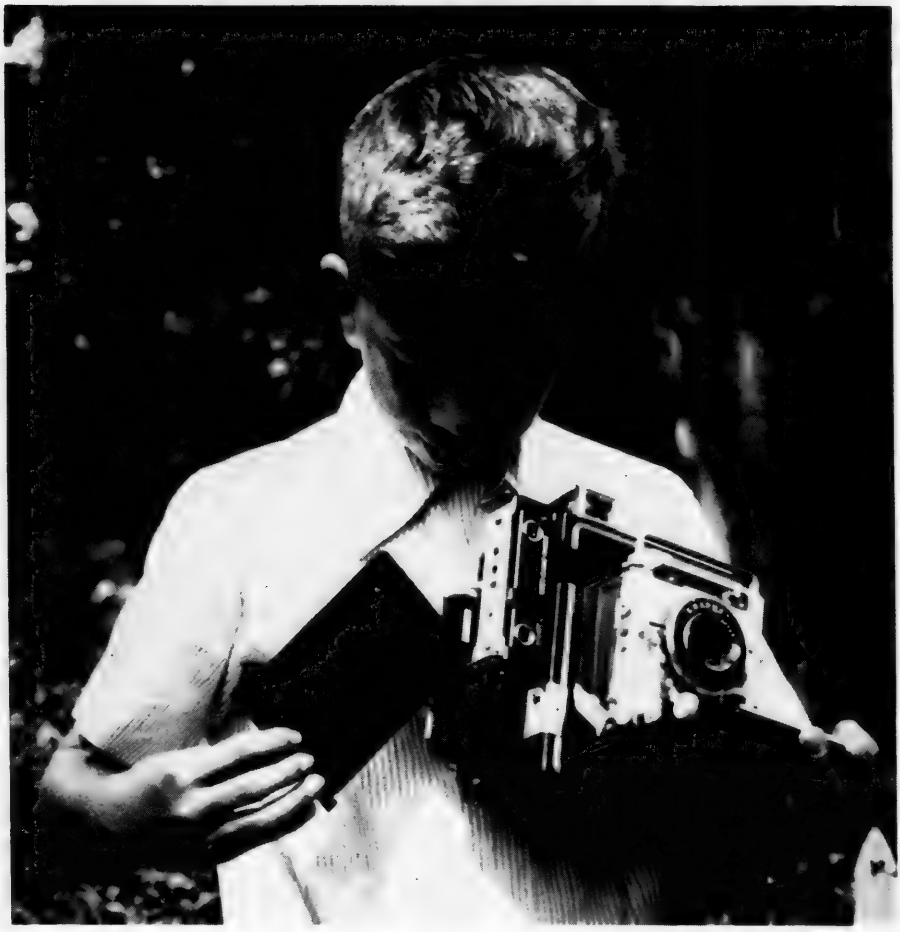

Figure 3. Incorrect insertion of dark slide by corner—will produce fog from light leakage.

However, if you will notice the out of focus portion of the picture, you will see a peculiar pattern which is caused by the tapes on the lens — this will only show in the part of the image that is not in focus. Those of you who have twin lens reflex cameras can use this idea to advantage on the top or finder lens. A simple cross formed by two narrow strips of adhesive tape will assist you in determining when the image in the finder is sharp. The pattern will disappear when the image is in focus.

We can imagine what happens when we use a piece of cloth or tissue to clean the lens when there is dust and dirt on the lens, when we remember that dust is abrasive. Therefore, let us first take a soft camel hair lens brush or a clean syringe and remove the dust; then we can use a piece of lens tissue designed for photo-

graphic lens cleaning and gently wipe the lens surface clean. Use no more wipes than absolutely needed to get the lens clean. It is needless to say that we should avoid touching the lens with our fingers. If this cannot always be avoided, the finger print should be removed immediately. Some finger prints will carry sufficient amounts of acid to permanently etch the print into the lens.

One of our most common and sometimes most baffling trouble with the camera is the light leak. Light leaks appear from many different causes. Those of us who use the film holder type of camera have probably run into this leak at least once during our lifetime. This is a leak we cause ourselves and now you will see how we do it, figure 3. The operation is called cornering a slide. By inserting the point or corner of the dark slide into the holder first and then following through with the motion of pushing the slide in, we open the light trap across the holder and, of course, if it's in bright daylight or sunlight a leak is sure to show, figure 4. This one was made also by cornering the slide.

Some equipment may be old and the bellows folds have been opened and closed so many times that with the assistance of dust particles, a pin hole develops and we have a light leak. The bellows leaks usually look like this, figure 5, but just as surely as I say that a bellows leak will show that looks entirely different. Many times a bellows leak shows up when it is not convenient to have the camera in a repair shop even for a few days. There is no reason why we can't take care of this ourselves — at least make a temporary repair. First we must find the pin hole. Using a 25 watt show case bulb in a socket on an extension cord, we go into a darkened room and then insert the bulb inside the bellows, either through the back, or by removing the lens board if it's that type camera. Sometimes it's best to check both ways. The pin hole will show clearly and can be marked on the outside with a piece of white chalk — just a touch is sufficient to mark it. There are several firms who make a black *opaque cloth tape.* Remember it must be opaque and it should be cloth to fold easily with the bellows. Cut off a piece of tape one inch long or longer depending upon whether it is one hole or several holes we want to cover. Round off the corners of the tape to eliminate the pointed corners from lifting too easily. Place the tape over the pin hole either on the inside or the outside and press it firmly into place using both hands pressing against each other.

There are many other possibilities of light leak and most of these require diligent research to find them. When a leak cannot be located, then we must call upon a reliable camera repair shop. A negative or two or more showing the leak will be invaluable to the repairman in locating the leak. Be certain to supply him with that evidence.

I know it will seem absurd to you but some photographers — good ones too — can't recognize the difference between camera motion and a picture blurred by improper focus. Camera motion can be detected usually by examination under a

Figure 4. Streak from light leakage shown in figure 3.

magnifying glass, looking for small highlights. These will usually appear streaked or as in a double image. Contrast camera movement with a picture in which the foreground is out of focus. You can readily see that the background is sharp which eliminates the possibility of camera movement. Notice that in a blurred portion of the picture the foreground shows no evidence of highlights streaking or a double image forming which is characteristic of improper focus.

Out of focus pictures are sometimes caused by camera fronts or lens mounts that are out of line with the film plane of the camera. Special tools are usually used to check this but an ordinary carpenter's square can be used to be sure that the camera bed is perpendicular to the film plane and also that the lens mount is perpendicular to the camera bed.

Exposure control and perhaps the heart of the camera is the shutter, which may be compared with a watch — both have small parts, small gears, etc., but there the comparison ends. The watch is usually sealed pretty well against dust, but still has to be cleaned every year or two. The shutter cannot be sealed as there are levers protruding with which we operate the shutter, so much more dust must enter the shutter than does a watch. A watch ticks along rhythmically and is always in continuous smooth motion. The shutter is set and then tripped and the hundred or so parts bound into action and suddenly stop. All this happens in a second or much less. Considering this, the shutter in its normal performance works harder and

Figure 5. Streaks in picture from bellows leak. Courtesy of Eastman Kodak Co.

must be much more rugged than a watch. This again points to the importance of keeping the camera clean. The more dust in the camera, the more dust there is to enter the shutter; the more dust in the shutter, the faster it will wear out and need replacement or repair.

Perhaps it would be well to look over the operation of a few of the commonly used shutters. The Graphex fully synchronized shutter is a fairly recent one, first produced in 1945. This shutter must be cocked first before using on any speed or time and bulb. The shutter speeds may be changed before or after the shutter is cocked. A half moon plate and a pointer on the bottom of the shutter controls the synchronizer setting. This setting must be selected and set before the shutter is cocked. The setting should not be changed after cocking shutter. Should such a change be desired, put on a lens cap, disconnect the shutter from the flash gun, and release the shutter, make the change in the sync. setting and then recock the shutter.

Another commonly used shutter is the Kodak Flash Supermatic. This is a presetting shutter also, and must be cocked for all speeds including time and bulb. The flash supermatic shutter has an additional cocking lever for use with either class M or class F flash bulbs. On this shutter, electronic flash of the zero delay

Figure 6. Left. Picture of flash bulb with proper shutter adjustment.
Figure 7. Right. Picture of flash bulb when synchromation is late.

type may be used by operating the shutter in the normal manner. To change from Class M to Class F bulbs, or vice versa, it is necessary to loosen a nut on the face of the shutter and move the scale marked M and F to the desired position. This change must be made when the shutter is not cocked. The Ilex Synchro Shutter is also a preset type shutter on all speeds including Time and Bulb. Speeds may be changed after shutter is cocked or before. This shutter has an additional lever which must be used for any type of flash. The flash selector is a small wheel on the side of the shutter which does not show in the picture. This flash selector may be changed either before or after the shutter is cocked.

One of the most popular shutters of former years is the dial set Compur. A presetting type shutter on speeds only but not on Time and Bulb. Speeds can be changed when shutter is cocked provided dial is turned in direction of arrow only. Shutter must be released before small dial on left can be turned to Time or Bulb and then shutter is operated by release lever only. A later model Compur known as rimset Compur is also a preset shutter on speeds only. This shutter should be released when speeds are changed. When using time or bulb, the release lever only is operated. When the speed ring is turned to the highest speed an additional heavy spring is wound up, sometimes causing the rim to move hard.

Synchronized flash is now very popular and commonly used with less trouble than ever since flash bulbs were invented. Before the War about 99% of all

flash problems could be traced directly to batteries. Now I'd say about 50% of all flash problems can be traced directly to batteries used. This, I believe, is due to the fact that we do not understand that there are two types of dry cells, in each dry cell size, made today. The common dry cell which we can purchase in any hardware, drug, or department store is made for search light and many other uses — it is a long life battery and of no use whatever in a flash gun. The other type dry cell is the one that is designed and made and marked expressly for photo flash use. This is not the same cell with a different jacket, but is a special cell with high amperage output and low internal resistance. It is not made for long life. We should be sure that we look on the cell jacket for the words "made for photo flash use." There are several manufacturers who make them and as far as I can tell, they are all good. We should also watch for the date stamp; as these cells are not long life, they will spoil by sitting on the shelf if they are left for a long period. For best results the dating should be at least six months in advance of purchase date. If we can find cells dated a full year ahead, so much the better.

While we are talking about batteries, we should look into the method of checking or testing them. We should not use an ammeter as it will damage the batteries and will not give us a good picture of their condition. Use a two or three volt, voltmeter in series with a one ohm resistor. With this combination we discard batteries that read less than .7 of a volt. The Bright Star battery makers have brought out a pocket battery tester which I consider worth mentioning. This will tell how the batteries are and can also be used to test the flash bulbs. It sells for $4.95

Flash gun cords which have moulded plugs are another common source of trouble. The only thing we can do about them is to always carry spares and discard the doubtful cords immediately. Look for rust and corrosion on the battery spring in your battery case, or rust anywhere on the flash equipment as another possible source of trouble. Most stores now have electronic flash testing equipment and can check synchronization, usually without charge. However, one can efficiently check his own equipment in the darkroom with the use of a flash bulb and a sheet of film or bromide paper. The procedure is simple. Connect the flash gun but leave it off the camera. Don't use the reflector. Set a 11 or Press 40 bulb in the battery case socket and focus on the bulb, using ground glass, of course. Stop the lens down to the smallest opening and a high shutter speed 1/200 or 1/400 if you commonly use that speed. Load a holder with a piece of bromide paper or slow film and fire the gun as you normally would. When the paper is developed, we should get an image that looks like figure 6. The entire bulb should be black. If we get an image like figure 7 showing some of the wire has not yet burned, the shutter opened too soon. Likewise if the bulb is only partially black and there is no unburned wire, then the shutter opened too late. Should

it be necessary to send the camera to a repair shop for synchronization, one should be certain that the entire equipment, including shutter and solenoid on board, cord or cords, battery case and reflector if the midget bulb is used, is sent. Only with the equipment exactly as it is used, can a dependable test be made.

In conclusion, these are all simple thoughts and we have undoubtedly known them all before; however, I hope that bringing them to mind once again will prove helpful in our future work.

(Editor's Note: Babcock's talk was illustrated with 30 lantern slides covering all the points mentioned. The more important ones are included here.)

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Some Viewing Devices for Transparencies

LEONARD REID DAVIS, Ph.D. and DALE A. PORTER, Sc.D.*

A BIOLOGIST is frequently confronted with the necessity of making displays of research or teaching materials. One of the easiest ways of making effective demonstrations is to show a few of the best color tranparencies in his collection.

Fallon[2] has designed a practical viewbox for transparencies which was made like a sectional bookcase, and was assembled to the desired height from fitted units. Ordinary electric light bulbs were utilized, and attention was called to the necessity for large openings at the tops and bottoms of all units to allow for circulation of cooling air to prevent damage to the transparencies by overheating. Larger units were provided with horizontal fans for forced drafts to reduce the fire hazard.

The following description is of a safer, simple method for displaying 2″ x 2″, 3¼″ x 4″ and larger tranparencies, Figure 1. We have demonstrated a viewbox[1] made from a war surplus, Air Corps lighting unit (Lamp Assembly, Floor Light, Portable, Fluorescent Type, B5) which did not overheat even though it was left on for 24 hours. The unit was a metal box containing six 15-watt fluorescent tubes, which furnished more than adequate illumination, with no need to worry about heat damage to valuable color transparencies.

The box was modified by removing the grooved reflectors back of each tube and replacing them with a white sheet of artists, heavy weight cardboard, curved to make a single concave reflector. Any ventilated flat metal or wooden box painted white inside and fitted with four or five fluorescent tubes, can be substituted for the war surplus light.

The light box for the viewer required a small amount of diffusion to reduce the intensity of the illumination and to produce a soft evenly lighted background. Tracing cloth was used but tracing paper, matte plastic sheeting, or ground or opal glass could be substituted.

The unique feature of this viewbox was that it holds transparencies in front of the light by means of aluminum divider strips or cap molding designed for fastening wallboard to walls. The wider edge at the back of the aluminum strip was sawed off to make the front and back nearly the same width, Figure 3. This left two grooves in a strip of metal, of the exact size to hold a color transparency even when it is mounted in glass. Ten of these strips were needed. They

*From the Regional Animal Disease Research Laboratory, Bureau of Animal Industry, Agricultural Research Administration, United States Department of Agriculture, Auburn, Alabama.
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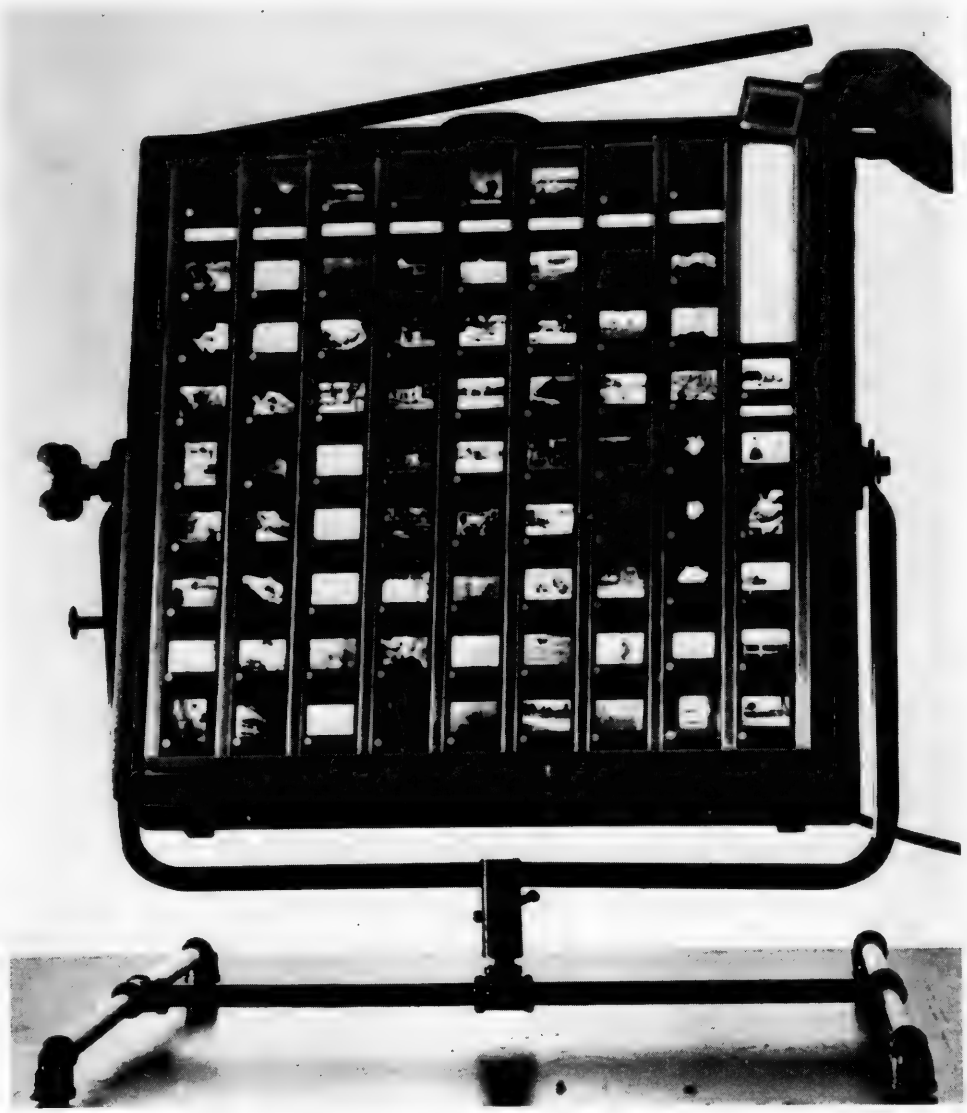

Figure 1. Inserting color slides into a viewbox made from a war surplus fluorescent light. Ten aluminum divider strips were trimmed to support 81 transparencies. (Photographs by L. R. Davis)

were notched at the bottom with a hacksaw to straddle the lower frame of the light. Enough of the front portion of each strip was removed at the top to allow it to slide under a retaining strip across the top of the light box. Two shorter horizontal strips were added as ornaments at the bottom to cover the ends of the vertical strips. The supporting portion of the light was made from

Figure 2. A rectangular frame made from divider strips that will hold nine color slides on a desk lamp for small demonstrations.

one-half inch pipes and fittings. Rubber stoppers were inserted in the lower openings of the elbow joints to prevent marring the table.

In setting up the display, the metal strips were arranged in their approximate positions and the color slides were inserted at the top to fill all spaces, Figure 1. This viewbox holds 81 mounted 2″ x 2″ slides, with a small space left over. This unused space was filled with typed legends bound between glass cover slides cut to fit the space. When fewer slides are shown, unused spaces should be filled with strips of cardboard to block the light. Uncovered transparencies should be mounted in glass, or the entire viewbox covered with a sheet of glass or clear plastic to protect from dust and fingerprints. A 4-inch reading glass kept near the viewbox can be used for observing small details. Larger transparencies or 3¼″ x 4″ lantern slides can be mounted on the viewbox by changing the positions and reducing the number of vertical strips. It is possible to show rows of different sizes at the same time. If unmounted transparencies are to be used exclusively, the narrow grooved divider strips of the type designed for applying linoleum wall covering, can be used instead of the wider grooved strips made for the pressed wood type of wallboard.

By using one or two fluorescent tubes, an elongate, smaller viewer can be made. The writers have constructed one to fit the reflector of a desk lamp, Figure 2. This one is useful while editing and selecting slides or for displaying as many as nine slides. The transparencies are pushed into one end and out of the other. The rectangular frame was made by cutting off only one edge of

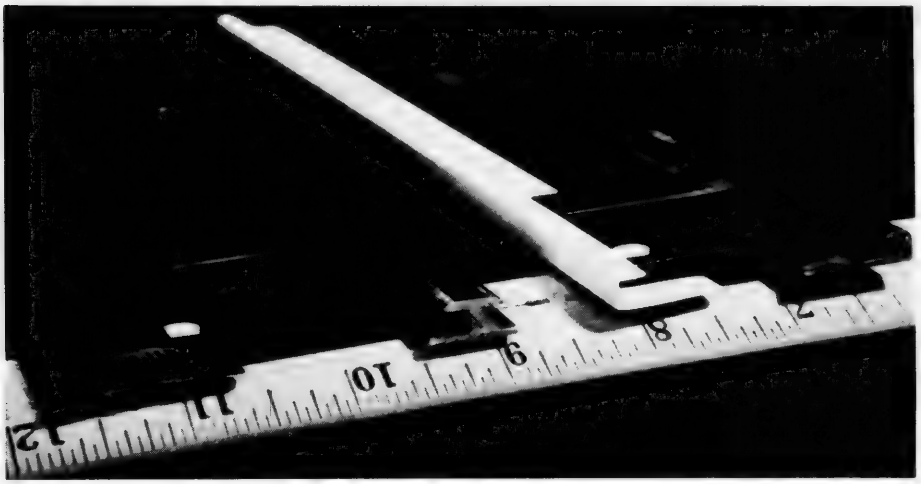

Figure 3. An untrimmed aluminum divider strip on the left, compared with a properly trimmed divider strip. Toward the right are untrimmed white plastic and aluminum cap molds. Measurements are in inches.

two divider strips, and using two flat strips of aluminum to connect the ends. The frame was bolted to each end of the reflector and can be left on the desk lamp while it is in normal use.

Similar rectangular frames can be made from divider strips or cap molding, Figure 3, of the proper length to be hung or fastened in front of the viewbox, X-ray viewer[3], or even a window. In this way a single row of related transparencies can be stored in the proper sequence, permitting rapid changes of laboratory demonstrations. In museums or classrooms, fluorescent tubes could be recessed behind cap molding frames, and arranged the full length of a wall for effective displays.

Since making the viewbox, we have found that white plastic divider strips and cap moldings, Figure 3, are now available from mail order and building supply companies. One of these strips was found to be easily cut with a knife or shears. Plastic strips are less expensive and easier to cut to the proper size. Even though they are more flexible, they should work almost as well as the metal ones, providing they are not made too long and do not support too much weight.

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Footprints

C. E. ENGEL, A.R.P.S., A.I.B.P., F.Z.S.*

THE contours and landmarks of the plantar surface have been recorded in various ways for some time. Gaits are normally studied through the medium of the motion picture film. Little, however, has been done to investigate the pattern of footprints created by running or walking. Such studies may reveal a wealth of information. The direction and any deviation from the straight line can be measured and compared with the pattern of a control or with that of the same patient at various stages of the disease and during treatment. Detailed investigation will show the angle of each foot print in relation to the forward direction, as well as its distance from the next and the preceding impression.

The foregoing remarks indicate that this method enables the study of a dynamic event with the help of a static record. This may be mechanical, such as the pressure imprints in moist sand or snow. Figure 1 shows an interesting method employed in 1910 by the late Sir James Purves Stewart at Westminster Hospital, London. The patient stood in a bucket of whitewash and then walked over a mackintosh, which was subsequently photographed. The objections here are obvious. Permanence and scale are the most important criteria and both can be satisfied by photography (figure 2.)

Reasonably large sheets of printing paper, which yield a rich black, such as 10 x 8 in document copying paper, are pinned to the floor, figure 3. They are first numbered on the back for easy identification after processing. The area thus covered must be wide and long enough to provide a valid medium for the experiment. The subject's feet are then coated with cedar wood oil or with a thin layer of vaseline.[1] As the patient walks over the path of paper, each foot will leave a series of imprints where it has touched the ground, figure 4. This stage of the procedure can be carried out in daylight. In fact some light is necessary, so that the paper is fogged before it is processed. As the sheets are developed they will turn black except for those areas coated with oil or grease, which repels the solution and stays undeveloped and white. The surface of the paper is then wiped clean, so that all unexposed silver halides can be dissolved and washed out. These, now permanent, records are dried and fixed together in manageable groups, according to the number on the back of each sheet. The following diagram, figure 5, will indicate all stages.

*The Department of Medical Illustration, Guy's Hospital Medical School, London, England.
Received for publication March 29, 1952.

1. Jeffreys, N., and P. Hansell, 1951. Some methods of foot recording. Med. Biol. Illus. 1(1):24.

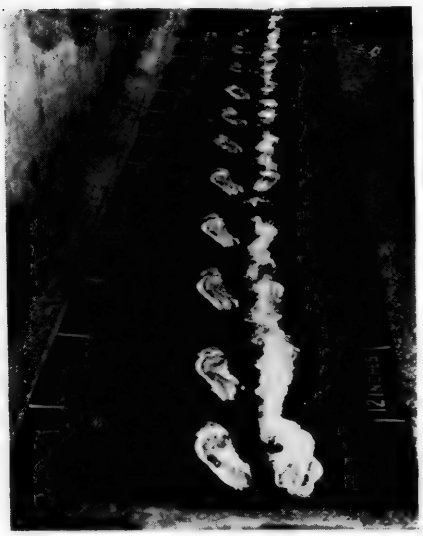

Figure 1. Right hemiplagia.

Figure 2. Footprint.

Figure 4. Tabes dotsalis. Left: eyes open, right: eyes closed

The static recording of a dynamic event has been described. Footprints are made by walking on photographic paper. This turns black on development, leaving only such areas white which retained the oil or grease from the plantar surfaces. The record can be reduced in size by photographic copying, so that measurements and comparisons are made possible.

Figure 3. Working arrangement.

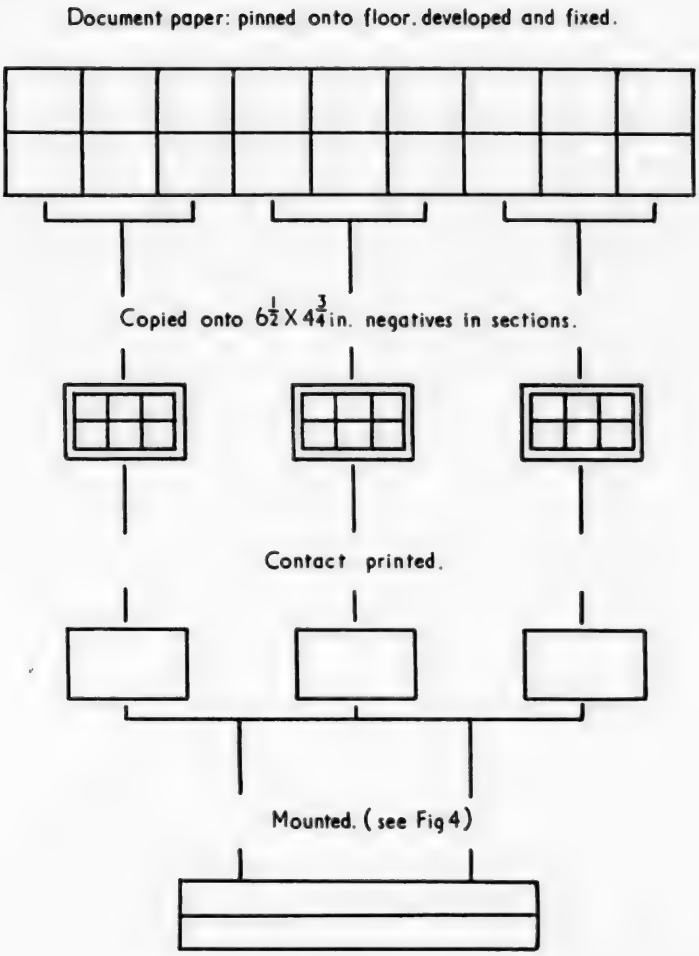
Document paper: pinned onto floor. developed and fixed.
Copied onto 6½ X 4¾ in. negatives in sections.
Contact printed.
Mounted. (see Fig 4)

Figure 5. Diagram of various steps involved.

I am indebted to Professor W. R. Spurrell of Guy's Hospital Medical School for permission to reproduce figure 4., and to Dr. P. Hansell for kindly supplying figure 1. from his collection.

Improvements In Presentation of Material With Lantern Slides*

C. MARESH, L. PESYK and M. L. HUSELTON**

MANY articles have been written to guide those who have occasion to use or prepare lantern slides to illustrate an oral presentation. Difficult indeed is the job of preparing legible slides of masses and masses of data which the speaker proposes to flash on the screen at one sitting.

Theory and General Requirements

The principles of optical projection have been known for a long time. In 1914 Gage[1] suggested that the optimum size of the projected image should be one-fifth the distance from the screen to the back of the room. Thus, for a room 50 feet deep, a screen 10 feet wide is recommended. The ratio of room size to image size is called the "room image factor." One can have such an optimum ratio or "room image factor" and still not have a legible slide. The size of the original copy as well as the size of the lettering which is reduced photographically to the size opening of the standard lantern slide must be taken into account. This was done by Knapp[2], American Standards Association[3], Maurer[4], Antwerpen[5], Sage[6], and by Bonnell[7]. The relationship between size of copy and the "room image factor" is as follows:

$$K = CR/I$$

where C is the size of the copy, R/I is the "room image factor" and K is the proportionality constant. As the size of the copy is increased the size of the image must be increased or the person must sit closer to the screen. The size of screens is limited and it is impossible for everyone to sit in the first row seats or the screen may be placed a considerable distance back of the speaker. It, therefore, becomes necessary to bring the slide closer to the audience. This can be done by limiting the size of copy and using sufficiently large lettering. Maurer suggested that the size of copy be multiplied by the "room image factor" and this product, which by definition is the proportionality constant, be taken as the distance at which the copy should be viewed to see if it is readable, or better still this viewing distance should be doubled as a safety factor for those who have less than 20/20 vision.

Bonnell, in the very complete treatise on the subject entitled "Preparation of Effective Lantern Slides", suggested actual minimum letter heights. Bonnell intro-

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duced the letter height function H into the formula for the maximum allowable width of copy:

$$C = K'lH/R$$

The new constant K' is given the value of 400 for a recommended "room image factor" of 6 with the copy and letter height given in inches.

As pointed out by Danziger[8], rules involving "room image factors" and letter heights can become very complicated. His device for judging legibility of copy for lantern slides is an ingeneous one. The only information required is the focal length of the projector lens. A clear glass with standard slide mask (2¾" in height and 3" wide for the 3¼ x 4" slides and 26 x 38 mm for the 2 x 2" slides) is placed at a distance equal to the focal length of the projector from the eye. The copy is placed in line behind the mask and moved back and forth until it just fills the mask. If the copy is legible at this distance, it will be legible when the slide prepared from it is projected on the screen.

Formulas are fine and have been useful, but in many cases there is no substitute for good horse sense. The slide must be "packed" like a suitcase for air travel. Non-essentials must be eliminated, decimals cut off and abbreviations made. Van Pelt[9] in his article entitled "Lantern Slides and Such" has done an excellent job in putting this across.

Composition

For optimum utilization of space available within the mask of 3¼ x 4" or 2 x 2" slides, the ratio of height to width of slide copy should be as close to 0.8 as possible.

A common misconception often encountered is that slides are made more legible by spreading out the data. Actually, the reverse is true. Spreading out of the data with waste space between columns, etc. seriously limits the size of the letters on the slide, and therefore, on the final image on the screen. Crowding of letters, of course, must be avoided.

A slide should present one and only one central idea and should be as brief as possible. It is far better to prepare two or more slides rather than one crowded slide which will confuse the audience.

Figure 1 is representative of copy which is often submitted to be made into a lantern slide. Too much data is presented, headings are entirely too long, the composition is bad and repetition is noted throughout. If the total market for lace curtains is 12 millions and 75% might be treated with fire retardant then anyone with normal intelligence can calculate immediately that the market for fire retardant would be 9 million pounds annually. Education or editing is, therefore, essential in the preparation of effective lantern slides. This same material was

THE POTENTIAL MARKET FOR FIRE RETARDANT TEXTILES

	TOTAL MARKET LBS. OF CLOTH ANNUALLY	% OF TOTAL ON WHICH FIRE RETARDANT FINISH MIGHT BE DESIRED	MARKET FOR A FIRE RETARDANT FINISH LBS. OF CLOTH ANNUALLY
BRUSHED NAPPED AND PILE FABRIC	6,900,000	50%	3,450,000
LACE CURTAINS	12,000,000	75%	9,000,000
OTHER CURTAINS	30,000,000	50%	15,000,000
SHEER GOODS .... COTTON	36,000,000	75%	27,000,000
RAYON	9,000,000	75%	6,750,000
WORK CLOTHING	270,000,000	5%	13,500,000
CHENILLE BEDSPREADS		0%	
CHENILLE ROBES	7,700,000	75%	5,000,000
BED LINENS	160,000,000	2%	3,200,000
UPHOLSTERY	84,000,000	25%	21,000,000
SEAT COVER CLOTHS	10,000,000	25%	2,500,000
TOTALS:	625,600,000		106,400,000

Figure 1. Typical lantern slide copy prepared with regular typewriter.

MARKET - FIRE RETARDENT TEXTILES

	MARKET MILLION LBS. CLOTH	% TOTAL MARKET
LACE CURTAINS	9	75
OTHER CURTAINS	15	50
SHEER COTTON	27	75
SHEER RAYON	6.8	75
CHENILLE ROBES	5	75
UPHOLSTERY	21	25
WORK CLOTHES	13.5	5

Figure 2. Same material as in Figure 1 edited and copy prepared with Varityper.

edited and is shown in figure 2. For a more detailed discussion on composition and choice of subject matter, see the articles mentioned above by Bonnell and Van Pelt.

Copy Preparation

The copy for figure 1 was made with a standard typewriter while that for figure 2 was made with the Varityper (Made by Ralph C. Coxhead Corp., 333 Avenue of the Americas, New York 14, N.Y.) using express Gothic type. This typing machine, shown in figure 3 has electrically controlled action insuring evenly typed letters. The young lady is shown inserting one of the type fonts which contain 3 rows of 30 characters each or a total of 90. All styles and sizes of type are instantly changeable. Two fonts are held in the machine at one time. There

Figure 3. Typist inserting type fonts into the Varityper.

are 54 popular English type fonts, including: Roman series; modern print-face series; italic series; Gothic series, with matching boldface fonts available. This machine has been found to produce very satisfactory copy for lantern slide preparation.

Hand lettering, of course, is the ideal method of preparing copy for lantern slides. The only objection to it is the expense. Graphs must be hand drawn of course. For tables, however, and even for captions for graphs, several types of lettering layouts are available for photographic reproduction. Paper letters are available from artists' supply stores. Other types are "Artype" and "Fototype." (Paper letters available from Tablet and Ticket Co., 1021 W. Adams St., Chicago 7, Illinois; Artype Inc., 549 Randolph St., Chicago 6, Ill.; Fototype Inc., 1414 Roscoe St., Chicago 13, Ill.)

Fototype is available as opaque and transparent letters. Figure 4 shows the pads of individual letters which are torn off and slipped into the self-aligning composing stick. In the case of the opaque letters, the letters are inserted right side down, the letters also appearing on the back. A strip of scotch tape is placed over the row of letters and the entire row removed after trimming of the edges. Due to the thickness of the opaque type letters, shadows may be cast around the edges during the photographic reproduction and some retouching of the negative is occasionally required. Care must also be taken that the letters do not buckle accordion-fashion which causes variation in reflection characteristics on the photographic emulsion. Proper fastening to the mounting will eliminate this difficulty. Fototype is also available as transparencies printed on microthin acetate and attached to a protective cardboard backing for aligning purposes. After the letters

Figure 4. Insertion of Fototype letters into self-aligning composing stick.

are placed in the composing stick face up, scotch tape is placed over them; the letters are trimmed above and below with a razor blade. The scotch tape is lifted, the acetate fusing with the tape and pulling away from its cardboard backing thereby producing a transparent shadow-free film ready for mounting. Figure 5 illustrates copy prepared with Fototype.

The question of which type of slide is to be used, the white on black (negative), or black on white (positive), often comes up. Much could be said in favor of both. Usually when color transparencies are intermingled with the lantern slides, the white on black, or negative, is to be preferred. The eye is tremendously more sensitive when it is adapted to darkness. Following exposure to ordinary artificial illumination, a stay in the dark may result in an increase in visual sensitivity by a factor of 1000. In most other cases, the black on white is preferred.

Lantern slides may be colored in various ways. The slides can be hand-colored with aniline dyes or water colors. Such coloring adds considerably to the effectiveness of the slide. Slides can be colored by replacement of the silver image with colored inorganic metal salts. (Kodak Reference Handbook and Kodak Data Book.) Hand coloring of 2 x 2″ slides is rather difficult and such coloring is usually restricted to the 3¼ x 4″ size. White on black slides may be colored by placing dyed cellophane strips over the open lines. Korson and Mallory[10] have recently suggested coloring lantern slides with colored gelatin sheet material.

Transparent Ozalid foil called Ozachrome (Ozalid, Division of General Aniline & Film Corporation) may be used for the preparation of a direct positive from the copy. Ozachrome is presently supplied in 8 x 10″ sheets and comes in a variety of colors namely, black, red, yellow, sepia, green and blue. The typewritten,

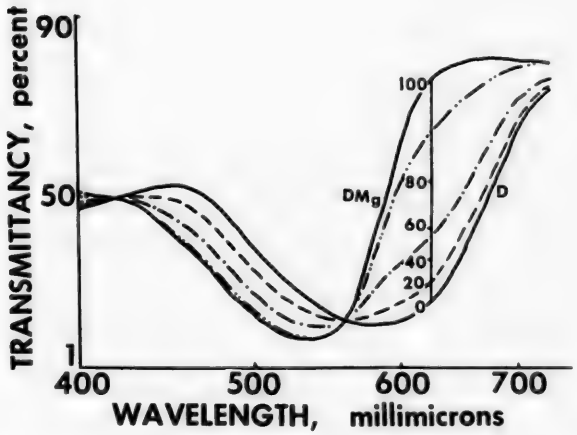

Figure 5. Lantern slide copy prepared with Fototype lettering.

hand drawn or transparent Fototype copy on tracing paper and the Ozachrome foil, in direct contact are first exposed in the Ozalid machine with a mercury vapor lamp. The Ozachrome is then developed and fixed in the machine with ammonia vapor. Since the transparency is made by direct contact, the size of copy is limited to the size of the opening of the 3¼ x 4″ slide. Ozachrome is ideal for the preparation of 8 x 10″ transparencies which are used in short projection distance projectors such as the Vue-Graph. (Charles Bessler Co., 60 Badger, Newark 8, N.J.)

Kodalith Ortho Type 2 film (Eastman Kodak Co., Rochester, N.Y.) has been found to be the most suitable material for photographically reproducing line drawing or letter texts, where extreme contrast is required. It is very satisfactory except that it comes in 8 x 10″ film sheets and requires cutting.

An additional list of references to articles on improvement of lantern slides has recently appeared in this journal.[11]

Summary

The manhours spent by an audience in listening to a paper certainly deserve many hours of the speaker's time in preparation of the material for suitable copy so that the lantern slides will be satisfactory. Often this is left to the photographer who is expected to prepare legible slides from copy that looks like hen tracks on a sandy beach or a page from the "Sears-Roebuck" catalogue. The preparation of good copy is the key to the preparation of legible lantern slides. As little as possible should be placed on each slide and further material eliminated. The lettering should be large, not crowded, nor spread out. In this paper some suggestions have been presented for the improvement in presentation of material

with lantern slides. It is our hope that it will be of value and that future lectures that we attend will be more pleasant and interesting because of better slides.

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Book Reviews

Stereo-photography in Practice. **E. F. Linssen. Fountain Press, London. Rayelle Foreign Trade Service, 5700 Oxford St., Philadelphia 31. 1952. xii + 326 pp. Illus.**

Twenty-three chapters cover from principles and apparatus to radiography, terminology and references making this book both complete and compact. Three chapters concerned with photomicrography discuss stereoscopic and nonstereoscopic microscopes, and methods for making stereophotomicrographs. The general problems of depth representation, ortho stereoscopy, enhanced and decreased depth, transposition, printing, mounting, viewing, special applications to surveying and map making are well treated. References are quite up to date and the book is less specifically British than many. It is recommended to all interested in stereoscopic photography. — O.W.R.

Color in Business, Science and Industry. **Deane B. Judd. John Wiley & Sons, New York. 1952. ix + 401 pp. Illus. $6.50.**

One-fifth of the book defines the functions of the eye, the aspects of color, color matching and color deficiencies. Half of the book describes spectrophotometers, colorimeters, color standards and languages, uniform color scales and the reproduction of pictures in color. The rest of the book is devoted to colorant layers, paints, Kubelka-Munk analysis, and the identification and formulation of colorants. The book is slanted toward industry and moral stories are dreamed up here and there to make it palatable to industrialists. However, the biological photographer can find out how color is measured, seen, and reproduced. Good descriptions with comment on the strong and weak points are available for systems like the Munsell and references like Ridgway's and the Color Harmony Analysis collection. Probably only with experience gained at the National Bureau of Standards could so much of the practical uses of color be included in so small a volume. — O.W.R.

BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

22nd ANNUAL MEETING

HOTEL NEW YORKER 10-12 September 1952 NEW YORK, N.Y.

PROGRAM

WEDNESDAY, SEPTEMBER 10

8:30 a.m. — REGISTRATION.

10:00 a.m. — CALL TO ORDER. C. GRAHAM EDDY, F.B.P.A., President; Chief, Medical Illustration Division, Veterans Administration, Washington, D.C.

10:10 a.m. — WELCOME. PERCY W. BROOKS, General Chairman, 22nd Annual Meeting; Chief, Department of Photography, Cornell University Medical College, New York, N.Y.

10:20 a.m. — THE STORY OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION. LEONARD W. JULIN, F.B.P.A.; Chief, Department of Photography, Mayo Clinic, Rochester, Minn.

10:30 a.m. — PRESIDENT'S REPORT AND FIRST BUSINESS MEETING.

11:30 a.m. — OPENING OF SALON AND COMMERCIAL EXHIBITS.

12:15 p.m. — OFFICIAL LUNCHEON. Address: Training Aids in the U.S. Navy. Albert M. Hassler, AL7-U.S.N. Office of Naval Research Special Devices Center, Port Washington, N.Y.

Afternoon Session

OSCAR W. RICHARDS, Ph.D., Editor, Journal of the B.P.A., Presiding.

2:00 p.m. — THE EYE AS A PHOTOGRAPHIC LENS. RALPH P. CREER, F.R.P.S., F.B.P.A.; American Medical Assn., Chicago, Ill.

Whenever the subject of elementary photography is taught, the general design of a camera is compared to the optics of an eye. If the comparison is so exact, it should be possible actually to use an eye as a camera. Fresh eyes from pigs, sheep, and beef cattle were obtained from the Chicago Stock Yards, and a series of experiments was conducted. A special apparatus was designed and constructed to hold the animals' eyes in place; a camera shutter was mounted in front of the lens, and provision made to substitute a piece of photographic film for the retina. Successful photographs were taken in this manner. This is believed to be the first time that an eye was actually used as a camera.

2:25 p.m. — NEW LIGHT ON AN OLD OPERATING ROOM PHOTOGRAPHIC SETUP. CHARLES P. HODGE, Montreal Neurological Institute, Montreal, Canada.

The operating room setup for photography through a mirror, originally described to the B.P.A. by its designer, Peter Hayden, F.R.P.S., in 1936, has undergone a number of changes. In modernizing the equipment, two lights were mounted on either side of an Ascor Speedlight, to project pencil beams converging at a distance of 45 inches. The whole unit is mounted on a movable arm inside the operating-room, and is positioned so that the pencil beams are superimposed on the desired field. This results in consistent lighting for every field chosen for photography. With careful attention to bellows extension, negatives can then be printed accurately to a one-to-one image.

2:50 p.m. — METHODS IN CRYSTALLIZATION AND PHOTOMICROGRAPHY OF CERTAIN NUTRIENTS, ANTIBIOTICS, AND HORMONES. LESTER V. BERGMAN; The Bergman Associates, Brooklyn, N.Y.

Methods used in forming normal, clean, well-shaped crystals of diverse substances used in the medical sciences are described in sufficient detail to guide those who are experimenting. Crystallization is done under varied conditions, and using different solvents. Photomicrographs are taken usually by polarized light, with or without half-wave retardation, and some with phase. Crystals are usually single, but are selected at times to fit a format; often the artistic arrangement is more important than the quality of the crystallization.

3:15 p.m. — BRILLIANT PHOTOMICROGRAPHY THROUGH PROPER TISSUE PREPARATION. AVIS GREGERSEN, F.B.P.A.; University of Southern California Medical School, Los Angeles, Cal.

Only with appropriate fixation, dehydration, cutting, and final staining can the photographer be expected to produce a finished, clean-cut photomicrograph. Assuming adequate photographic equipment and good alignment, the subject material must be skillfully prepared in order to achieve satisfactory results. If the procedures described are carried out with care and skill, there should be no reason for the photographer not producing a properly exposed and executed lantern slide of a photomicrograph.

3:40 p.m. — EXPOSURE DETERMINATION IN PHOTOMICROGRAPHY. WILLIAM L. M. MARTINSEN, F.B.P.A.; Veterans Administration Center, Los Angeles, Calif.

Successful photomicrography in color requires accurate control of exposure. For the occasional maker of photomicrographs simple methods offer surprisingly adequate means for determining proper exposure. Electronic exposure determining devices are available to aid the busy photomicrographer.

4:05 p.m. — PHOTOGRAPHIC RECORDING IN SPATIAL VECTORCARDIOGRAPHY. ROBERT A. BROWN; Department of Medical Illustration, Medical College of South Carolina, Charleston, S.C.

In spatial (three-plane) vectorcardiography employing the cathode ray oscilloscope it is especially desirable to photograph the tracings as they appear on the screen, since this is the only means of recording for comparison and future study. Since the loop is only 1/10 second in duration, it is quite difficult at times to determine the actual shape and direction of travel of the beam. Still pictures can be made with any camera having a normal lens and shutter. A light-tight cone must connect the camera and the face of the cathode-ray tube, or the room must be in total darkness. For more detailed study by motion pictures, slow motion must be used.

4:30 p.m. — MAGNETIC SOUND RECORDING ON FILM. FRANK B. ROGERS, JR.; Vice-President, Reeves Soundcraft Corp., New York, N.Y.

In its comparatively brief history, magnetic sound recording on film has become an important tool for those who work in the field of audio-visual education. To be effective, this medium must be properly used. The types of magnetic sound on film, and proper recording methods are demonstrated. Various types of equipment presently available, as well as new developments expected in the future are discussed.

Evening Session

7:30 p.m. — MOTION PICTURES.

White Thromboembolism in the Minute Cheek Pouch Vessels of the Hamster (DAVID L. JOFTES)

Intravascular Agglutination of Red Cells in Hamster Cheek Pouch, Using Immune Anti-Erythrocyte Serum (DAVID L. JOFTES)

Osteoplastic Craniotomy (V. A. HOSP., DALLAS)

Two Methods of Cancer Detection (NORMAN GAINES)

Toxemia of Pregnancy (MERVIN W. LARUE)

Female Urinary Stress Incontinence (FRANK SHOOK, JR.)

Stab Wounds of the Heart (FRANK SHOOK, JR.)

Patent Ductus Arteriosus — Physiology, Diagnosis, and Clinical Considerations (WARREN STURGIS)

Simplified Craniotome Technic for Osteoplastic Flap (WARREN STURGIS)

Musicogenic Epilepsy (STANLEY J. MCCOMB)

Lake Opinicon Laboratories (H. W. CURRAN)

Phase Contrast Microscopy (COOKE, TROUGHTON & SIMMS)

THURSDAY, SEPTEMBER 11

LLOYD E. VARDEN, F.B.P.A., Secretary of B.P.A.; Vice-President, Pavelle Color, Inc., New York, N.Y., Presiding.

9:00 a.m. — BRIEF REPORTS ON THE ACTIVITIES OF RELATED PHOTOGRAPHIC ORGANIZATIONS.

Society of Motion Picture and Television Engineers. HERBERT BARNETT, Executive Vice-President, S.M.P.T.E.

Photographic Society of America. DON BENNETT, Editor, P.S.A. Journal.

Society of Photographic Engineers. EDWARD K. KAPRELIAN, President, S.P.E.

9:30 a.m. — THE ARRIFLEX MOTION PICTURE CAMERA. LOUIS J. FRATER; Kling Photo Supply Corp., New York, N.Y.

A unique motion picture camera for medical, scientific, and photomicrographic filming is presented. In this camera, a reflex mirrored shutter enables the cameraman to view and focus through the taking lens while the camera is running. Originally manufactured as a 35-mm. camera, a 16-mm. model has recently been produced.

9:55 a.m. — PHOTOGRAPHIC STANDARDS IN MEDICAL EDUCATION. JOHN K. LATTIMER, M.D.; Department of Urology, Columbia-Presbyterian Medical Center, New York, N.Y.

The individual physician is relatively unacquainted with the field of medical illustration. He is very sensitive to the high cost of lantern slides, photographs, and drawings. Several ways are outlined for pointing out to the physician the relative merits of good photographs and illustrations, and of their great value to him. Some of the common weaknesses of these media, and points of possible friction between the physician and the photographer are discussed, and recommendations made as to how to resolve such problems.

10:20 a.m. — CHARACTERISTIC, TYPES, AND APPLICATIONS OF 16mm. COLOR FILM STOCK. WALTER KISNER; Eastman Kodak Co., Rochester, N.Y., and HERBERT A. MACDONOUGH; Ansco, Binghamton, N.Y.

Reversible 16mm. color film stocks, and color duplication stocks manufactured by the respective companies are described, and appropriate filter recommendations given. Problems in the proper color rendition of biological tissues, including blood, are discussed. The new negative-positive color materials are mentioned.

10:50 a.m. — LATEST METHODS FOR THE REPRODUCTION OF DOCUMENTS. HERBERT P. PASCHEL; New York, N.Y.

Within the past few years several new methods have been developed for reproducing written or printed documents, some of which are based on principles entirely different from customary photographic procedures. These are described and illustrated, and their respective advantages and disadvantages are pointed out.

11:15 a.m. — PHOTOGRAPHY AND PHOTOSYNTHESIS — A CORRELATION. JAMES A. MAHAFFEY; New York, N.Y.

In the process of photosynthesis, as in photography, light is both a latent and a visible servant. By various photographic experiments a visual theory leading toward a scientific concept of photosynthesis is developed. A fundamental knowledge of plant morphology and growth is as necessary to the success of these experiments as is the selection of the proper photographic equipment and materials. Plant specimens were selected with great care, and were photographed as they grow normally. Camera angles were chosen for best visualization of detail, and color film was used so that the characteristic green color, indicating the beginning of photosynthesis in young seedlings, would be detected at the earliest stage.

11:40 a.m. — CINEMATOGRAPHY OF THE HUMAN EARDRUM. H. G. KOBRAK, M.D., Ph.D.; Department of Surgery, University of Chicago, Chicago, Ill.

A method has been developed by which the human eardrum and the nasal pharynx can be visualized and illuminated to such an extent that colored motion pictures can be taken. Cinematography is to be preferred to still pictures, because there are various phenomena in which the recording of motion is important, e.g., respiratory motion of the eardrum, reflex contraction

of the stapedius muscle, acoustic oscillations, and operative procedures. The method is described; coaxial light arrangement, focusing apparatus, and stroboscope attached to the camera are shown. A normal eardrum, and a number of diseased eardrums are demonstrated in a motion picture.

Afternoon Session

Four demonstrations on practical photographic methods are to be conducted simultaneously; twice on Thursday afternoon, and twice on Friday morning. In this way everyone attending the Meeting will have an opportunity to witness these demonstrations in small, informal groups.

The following subjects will be covered:

A. Latest Darkroom Methods in Making Prints (Parlor A). OWEN S. BILLMAN; E. I. du Pont de Nemours & Co., New York, N.Y.

B. Technics in Photomicrography (Parlor B). C. A. BRINKMAN; C. A. Brinkman & Co., Great Neck, N.Y.

C. Color Correction of Transparencies and Prints (Parlor C). MAUD KOTHE; Pavelle Color Inc., New York, N.Y. J. BOURGES MAYFIELD; Bourges, Inc., New York, N.Y.

D. Simple Methods for the Preparation of Motion Picture Titles, Charts, and Animated Diagrams (North Ballroom). DWINELL GRANT; Sturgis-Grant Productions, Inc., New York, N.Y.

2:00 - 4:30 p.m. — DEMONSTRATIONS.

Evening Session

7:30 - 9:30 p.m. — OPEN HOUSE. Members' guests and members of local camera clubs and other photographic associations are invited to visit our Exhibits.

FRIDAY, SEPTEMBER 12

Morning Session

9:00 - 11:30 a.m. — DEMONSTRATIONS.

11:45 a.m. — ELECTION OF OFFICERS AND SECOND BUSINESS MEETING.

Afternoon Session

GEORGE L. ROYER, Ph.D., F.B.P.A.; Calco Chemical Division, American Cyanamid Co., Bound Brook, N.J., Presiding.

2:00 p.m. — STEREOSCOPIC MOTION PICTURE PHOTOGRAPHY. FLOYD A. RAMSDELL; Worcester Film Corp., Worcester, Mass.

Stereo movies have now been developed to a point where the screen has the illusion of being a plate glass window through which the audience views the scene disclosed as if the objects were solid. The ability to take close-ups is dependent on a camera with a variable interocular. Both the camera used and a surgical film made with it are presented.

2:30 p.m. — THE MICROFILMING OF RADIOGRAPHS. ROBERT T. MORRISON; Medical Division, Eastman Kodak Co., Rochester, N.Y.

Recent photographic advances have made possible the microfilming of radiographs without significant loss of detail such as to jeopardize the authenticity of the physician's original diagnosis, and, if necessary, a faithful facsimile of the radiograph can be made. If space in an institution is at a premium, the saving in storage requirements for such a file of radiographs on microfilm can be considered to exceed the cost of the operation plus the cost of the unit. This process thus makes available expanded teaching facilities, wider reference sources, and a means of augmenting diagnostic reports with clarifying evidence.

2:55 p.m. — HIGH-SPEED PHOTOGRAPHY AND ITS APPLICATION IN BIOLOGICAL INVESTIGATION. KENNETH SHAFTAN; J. A. Maurer, Inc., Long Island City, N.Y.

The principles of high-speed photography — still, motion picture, multiple exposure and continuous motion — are here reviewed. Recent developments, including x-ray still and motion

picture photography, and image converter tube systems used in high-speed photographic applications are discussed. The characteristics and organization of this field of photographic instrumentation are explained, with emphasis on various applications of methods to biological investigation.

3:20 p.m. — PHOTOGRAPHIC COMMUNICATION OF SCIENTIFIC IDEAS. GERARD PIEL; Publisher, Scientific American, New York, N.Y.

Photography provides solutions for most of the problems which confront purely verbal communication of scientific ideas and information. It is clear that a picture can identify a microörganism, for example, far more vividly and precisely than its synthetic Latin name. Relationships between things which defy expression in the most carefully constructed prose can be made instantly apparent in a photograph. In addition, because it is itself a piece of evidence, a photograph carries more conviction than a drawing. The preparation of photographs which emphasize the principles by which ideas are communicated is discussed.

3:45 p.m. — INFRARED MICROSCOPY WITH THE ELECTRON IMAGE CONVERTER TUBE. CHARLES MARESH, Ph.D.; Calco Chemical Division, American Cyanamid Co., Bound Brook, N.J.

Photographs made by infrared rays afford certain advantages over those made by visible rays. Many substances, while being strongly absorbing or opaque in the visual range, become relatively transparent in the infrared region. The medium of photography with special infrared film has been resorted to in the past. With the development of the infrared image converter electronic tube, it is possible to view the effects of the infrared illumination directlv, and, where photomicrography is required, the image so formed may be photographed directly with regular film, or the camera may be substituted for the image converter tube by means of a simple right-angle glass prism, and infrared film used.

4:10 p.m. — TIME-LAPSE PHOTOGRAPHY — A NEW, SIMPLIFIED APPARATUS. MERVIN W. LARUE; President, Mervin W. LaRue, Inc., Chicago, Ill.

A simplified, compact and rugged apparatus has been designed which is at the same time reasonable in cost of construction. The unit consists of a ratchet type, solenoid operated, single-frame unit, which mounts on a camera having a single-frame shaft, plus a separate timer to operate this by remote control. The timer is driven by a flea horsepower sync motor operating a shaft upon which are mounted formica cams of various types and sizes. These actuate microswitches controling the lights and the exposure. An unlimited variety of intervals can be secured by merely changing the sams.

4:25 p.m. — TIME-LAPSE PHOTOGRAPHY OF LIVING TISSUE CULTURES. LEWIS W. KOSTER; Department of Surgical Pathology, Columbia-Presbyterian Medical Center, New York, N.Y.

A special apparatus has been developed for this study, involving novel mechanical features for interval timing and exposure determination. The biological, optical, and photographic problems involved are described, along with a brief discussion of film, filters, and other points of operating technic as applied to tissue culture photography.

4:40 p.m. — THE DYNAMIC APPROACH IN MOTION PHOTOGRAPHY. ROMAN VISHNIAC, Ph.D.; New York, N.Y.

Fixations which expose differences in chemical structure of plant and animal organisms after death alter the characteristics of normal molecular construction. Such artifacts thus introduced are difficult to evaluate. Among methods of microscopical technic which can make visible different physical and chemical properties of living organisms, color polarized light, colorization, is one of the most valuable. Hidden structures which disappear through killing and fixation of the organism can be made visible, and in their normal relations to one another. Results achieved, and future possibilities of using this method are discussed.

Evening

6:30 p.m. — COCKTAIL PARTY. The Eastman Kodak Co. was our host.

7:30 p.m. — ANNUAL AWARDS BANQUET. Speaker: ORRIN S. WIGHTMAN, M.D.

COMMERCIAL EXHIBITORS

The Following firms have cooperated with B.P.A. in making this Meeting possible. The Committee commends their exhibits for members' consideration.

Ansco, Aristo Grid Lamp Products, Inc., Bausch & Lomb Optical Co., Bell & Howell Co., Coreco Research Corp., Davis & Sanford Co., DuPont de Nemours, E. I. & Co., Eastman Kodak Co., Exakta Camera Co., Inc., Ferner, R. Y., Co., Inc., Gamma Instrument Co., Inc., Graflex, Inc., Heitz & Lightburn, Kling Photo Supply Corp., Mauer, J. A., Inc., Med-Pix Co., Opplem Co., Paillard Products, Inc., Pako Corp., Pavelle Color, Inc., Photo Metric Corp., Polaroid Corp., Rosenthal, Paul, Saltzman, J. G., Inc. — (American Speedlight), Speedlight Center, Sturgis-Grant Productions, Inc., Zeiss, Carl, Inc., Zoomar Corp.

22nd ANNUAL MEETING COMMITTEE

General Chairman
PERCY W. BROOKS

Commercial Exhibits
EUGENE L. OSTROFF

Projection
ROBERT WOLF

Program
WARREN STURGIS

Publicity
ELEANOR NEY

Official Photographer
PIERRE LEDOUX

Salon
SIDNEY SHAPIRO, F.B.P.A.
JOSEPH RUSSOTTI

Printing
MARGARET MARKHAM

SALON AWARDS:

Judges: MR. HENRY LESTER, F.B.P.A.
DR. MAURICE RICHTER
MR. JULIUS WEBER

Monochrome Prints

Clinical Photography:

Blue Ribbon	PERCY W. BROOKS *(Neuroblastoma — Right Orbit)*
Honorable Mention	DAVID LUBIN *(Anterior Dislocation of Lens with Complicated Cataract)*
Meriting Special Attention	HAROLD BAITZ *(Trans-Laryngeal Anesthesia)*
	MARGARET MARKHAM *(Blood Vessels of the Conjunctiva)*
	MARGARET MARKHAM *(Iris — (a) Congenital Pupillary Membrane (b) Crypts of Normal Iris)*
	JAMES A. DIMOND *(Series — Pollicization of Right Index Finger)*
	NAT KANTOR *(Aspiration of Orbital Cyst)*

Specimen Photography:

Blue Ribbon	EARL C. BARTLETT *(Polyposis)*
Honorable Mention	EARL C. BARTLETT *(Sub-Acute Bacterial Endocarditis)*
Meriting Special Attention	PIERRE LEDOUX *(Tibia — Sarcoma of Bone (Pagets Disease))*
	PIERRE LEDOUX *(Cardiac Insufficiency due to Aortic Valvulitis)*
	JOSEPH MERVA *(Stone — Submaxillary Gland)*
	ROBIN WHITE *(Retroperitoneal Myxosarcoma)*
	T. W. SCOTT & J. E. JACKSON *(Heart in Rheumatic Heart Disease)*
	THOMAS MASTERSON *(Total Hysterectomy — Fetal age 13 weeks)*
	HOMER L. JONES *(Dissected Mouse — High Sodium Diet)*

Photomicrography:

Blue Ribbon	LESTER BERGMAN *(Movement of Normal and Leukemic Blood Cells — Dark Phase)*
Honorable Mention	HAROLD BAITZ *(Series — Histoplasma Capsulatum Endocarditis)*
Meriting Special Attention	LESLIE E. HIEL *(Vinegar Eel in Motion (a) 1/50 sec. (b) 1/5 sec.)*
	DEAN L. ALTMAN *(Meckel's Diverticulum)*
	F. W. MAYNARD *(Branched Insertion of Skeletal Muscle in Hamster Cheek Pouch)*
	RICHARD F. CARTER *(Neoaplectana Glaseri)*

Natural Science:

Blue Ribbon	None
Honorable Mention	EARL C. BARTLETT *(Skate)*
Meriting Special Attention	WILLIAM G. SMITH *(Series — Growth of Wheat)* D. PERRY BOAZ *(Sea Horses)* J. R. NEWBY *(Gynomolgus Monkey Study)* SIDNEY SHAPIRO *(Flicker Fledglings)*

Radioautography:

Blue Ribbon	JERRY WEINSTEIN *(Alpha Particle Tracks — Liver of Patient Given Thorotrast 20 years Ago)*
Honorable Mention	WILLIAM E. LOTZ *(Time Series Study — Uptake of Ca 45, P 32, Sr 90 in Femurs of Growing Swine)*
Meriting Special Attention	WILLIAM E. LOTZ *(Uptake of Ca 45 in Metatarsus of a Calf)* WILLIAM E. LOTZ *(Uptake of Fe 59 in Peanut Plant)*

Color Prints

Clinical Photography:

Blue Ribbon	JOHN P. VETTER *(Purpura — Child)*
Honorable Mention	J. R. NEWBY *(Anuerysm of Internal Carotid Artery)*
Meriting Special Attention	JOHN P. VETTER *(Harelip)* H. LOU GIBSON *(Varicose Ulcer)*

Specimen Photography:

Blue Ribbon	MEDICAL ILLUSTRATION LAB., V. A. Hospital, Hines, Ill. *(Pericardial Effusion)*
Honorable Mention	STANLEY D. HARRIS *(Meckel's Diverticulum)*
Meriting Special Attention	JOHN P. VETTER *(Mesenteric Cyst)* J. R. NEWBY *(Experimental Mitral Intumescence of a Dog Heart)* W. K. SHAW *(Hypernephroma, Kidney)*

Photomicrography:

Blue Ribbon	H. LOU GIBSON *(Moonlight Snack (Wood Frog Engorged with Fireflies))*
Meriting Special Attention	LESTER BERGMAN *(Three Methods of Color Reproduction)*

Color Transparencies
(2" x 2")

Clinical Photography:

Blue Ribbon	EUGENE OSTROFF *(Series — (a) Removal of Lens, Cataract Operation, (b) Trephine Operation for Glaucoma, (c) Corneal Transplant Operation)*

Color Transparencies
(3¼" x 4" or larger)

Clinical Photography:

Blue Ribbon	PIERRE LEDOUX *(Pre and Post Operative Exercises and Training Applied to Prevent Spinal Deviation Following Thoracic Surgery (Series))*
Honorable Mention	EUGENE OSTROFF *(Series (a) Tumor of Parotid-Excision, (b) Plastic Reconstruction of Esophagus)*
Meriting Special Attention	D. PERRY BOAZ *(Lymphosarcoma of Stomach — Reticulum Cell Type)* EARL C. BARTLETT *(Oral Lesions)* VERLIN Y. YAMAMOTO *(Gangrene of Foot)* W. ROMAHN, JR. *(Kinetographic Study of Above-Knee Amputee Gait)*

Specimen Photography:

Blue Ribbon	J. MULDOWNEY *(Renal Pathology)*
Honorable Mention	ADRIAN T. BROTHERS *(Gross Pathological Specimens)*
Meriting Special Attention	VERLIN Y. YAMAMOTO *(Kidney Renal Calculus, X-Ray Background)* W. C. BECK & R. E. DAVID *(Gross Specimens)* LLOYD A. WOLF *(Experimental Production of Endocarditis with Valvular Deformities In Dogs)*

Color Transparencies
(3¼" x 4" or larger)

Photomicrography:

Blue Ribbon	JERRY WEINSTEIN *(Fetal Kidney — 5 Stains)*
Honorable Mention	LESLIE E. HIEL *(4 Blood Smears)*
Meriting Special Attention	LESTER BERGMAN *(A Problem in Depth of Focus)* CHARLES P. HODGE *(Paraganglion)* CHARLES P. HODGE *(Paraganglioma)* D. PERRY BOAZ *(Gall Stones)* DAVID HILBRAND *(Peritoneal Metastasis, Carcinoma of Colon)*

Natural Science:

Special Award	DR. ROMAN VISHNIAC *(Series on Metamorphosis of Moth — Experimental (published in LIFE))*

Miscellaneous

Meriting Special Attention	L. D. WINBURNE *(Panel of X-rays — True Polyps of Colon — 42 individual views on one 14x17 X-Ray film (1 to 1)*

MOTION PICTURE AWARDS:

Judges: HARRIS B. TUTTLE, F.B.P.A.
DR. JAY GARNER
MR. HAROLD BAITZ

Cine Photomicrography

1st *"Intervascular Agglutination of Red Cells in Hamster Cheek Pouch"* by DAVID L. JOFTES

Clinical Record

1st *"Musicogenic Epilepsy"* by LARDNER A. COFFEY & REG YULE

Surgical

1st *"Stab Wounds of the Heart"* by FRANK SHOOK, JR.
2nd *"Osteoplastic Craniotomy"* by V. A. Hospital, Dallas, Texas

Special Award of Recognition

"Lake Opinicon Labs" by PHILLIP H. MOTT

Special Awards to Commercial Exhibitors

"Patent Ductus Arteriosus" by WARREN STURGIS
"Toxemia of Pregnancy" by MERVIN W. LARUE
"Two Methods of Cancer Detection" by NORMAN GAINES

ANNUAL AWARD DINNER:

The Eastman Kodak Company sponsored a Cocktail Party for members and guests prior to the Annual Dinner. The thanks of the membership are extended to the Eastman Kodak Company for making possible this most delightful event.

The following awards were made: The B.P.A. Fellowship Award was granted to Dr. Peter Hansell, London, England; Mr. Jay T. Fox, Seaford, L.I., New York; and Mr. David Lubin, Cleveland, Ohio.

BPA
Makes Headlines!
New York
Annual Meeting
by
Pierre Le Doux.
1952

The award for the best paper presented at the 22nd Meeting was given to Dr. Charles Maresh for his excellent paper entitled "Infrared Microscopy with the Electron Image Converter Tube." The judging committee consisted of Mr. Chester Reather, Chairman, Mrs. Maria Ikenberg and Mr. Massy Nakamura.

The award for the most outstanding paper published in Volume 19 of the Journal (1951) was presented to the Journal Editor, Dr. Oscar W. Richards, F.B.P.A., who had no previous knowledge that his paper, entitled "Tridimensional Cytohistology", had been selected. Dr. Richards' reticence in accepting the award was overcome when he was reminded that the paper chosen had been accepted for publication before he took over the Journal editorship.

The highlight of the evening was the presentation of the *Annual Award* to Mr. Leonard Julin, F.B.P.A., Mayo Clinic, Rochester, Minnesota. The citation was read by last year's Annual Award recipient, Mr. Ralph P. Creer, F.B.P.A., who presented Mr. Julin the beautifully inscribed certificate and jeweled gold key.

Orrin S. Wightman, M.D., Chairman of the Board of Trustees of the New York Academy of Medicine, and prominent figure in photographic circles, gave the main address of the evening entitled "Advances in Biological Photography Over the Past 25 Years". From the very start, Dr. Wightman had his audience laughing so vigorously that he frequently had to stop to be heard. Everyone thoroughly enjoyed the recounting of experiences in his early days of medical photography.

First Business Meeting, Sept. 10.

President Eddy called the meeting to order and then asked Mr. Percy Brooks, General Chairman for the 1952 Annual Meeting, to give his welcoming address.

President's Report: Mr. C. Graham Eddy, President, reviewed the continuing progress of the Association. He called particular attention to the fact that during the year 1952 the membership of the Association had exceeded 1,000 for the first time in its history. He also extended an open thanks to Sustaining Members and Contributing Members whose generous support had helped materially to keep the Association on a sound financial basis.

Mr. Eddy announced that he had accepted the resignation of Dr. Oscar W. Richards as Editor of the Journal, but with considerable reluctance. He commended Dr. Richards for having taken over the Journal under very trying circumstances and for getting it back on a definite publication schedule.

Mr. Eddy also announced the formation of a new committee, called the Education Committee, charged with the responsibility of surveying the schools in America which offer courses in photography, particularly those in medical photography. The hope is that eventually this committee can be instrumental in encouraging schools to undertake the teaching of medical photography to fulfill the great need that currently exists.

Members were advised by President Eddy that the Certification Committee had been requested by the Board to form a questionnaire to be used in determining the overall attitudes of B.P.A. membership on the question of certification. The Committee will continue its work in whatever directions indicated by the results of the membership survey.

Vice President's Report: Mr. Sturgis stated that his duties as Program Chairman for the New York Annual Meeting had kept him fully occupied. He hoped the program would be well received and thanked all of those who had cooperated with him.

Report of the Secretary: Mr. Varden announced the death of four members: Mrs. Beatrice Allison, Dr. David Davis, John Ross Murray and Dr. Edwin G. Van Valley. The Secretary's customary report on the growth of membership was not given since this was to be given in Mr. Tuttle's report of the Membership Drive Committee.

Report of the Treasurer: Mr. Levin presented a summary of his complete report as follows:

January 4, 1952 to September 1, 1952

Receipts:

Bank Balance — Jan. 4, 1952		$6,007.76	
Membership dues	$4,472.78		
Journal	1,094.40		
1951 Annual Meeting	6.00		
1952 Annual Meeting	400.00	5,973.18	$11,980.94

Disbursements:

Association Expenses (Printing, postage, misc.)	133.61		
Membership Drive	184.03		
1951 Annual Meeting	41.50		
1952 Annual Meeting	495.96		
BPA Exhibit at PSA	13.68	868.78	
Journal			
Printing Vol. 20, #1 & #2	1,950.89		
Reprints, postage, misc.	200.71	2,151.60	3,020.38
Bank Balance			$8,960.56

Receipts	$5,973.18
Disbursements	3,020.38
Surplus	$2,952.80

Mr. Eddy appointed Mr. Martinsen and Miss Shiras to audit the Treasurer's report with the request that their findings be presented at the Second Business Meeting for membership approval.

Report of the Editor: Dr. Richards reported as follows:

Cost of Journal:

Vol. 19		
	No. 3	$ 941.93
	No. 4	954.40
Vol. 20		
	No. 1	940.79
	No. 2	1,018.10
	No. 3	1,002.14

Costs for printing were about the same as last year. Distribution costs were greater because of an increased mailing list and increased postal charges. Fortunately, we were exempted from some of the postal increase as a non-profit making institution.

Cost of Editorial Office —	Postage	$35.64	
	Supplies	11.67	
	Postage on returns	.79	
	Cartage*	28.18	
	Labor and assts.	36.60	$112.88
	Sales issues and indices	$212.55	
Credits —			
	Accounts receivable	2.45	$215.00

*Back issues from Yonkers to Philadelphia.

The August number has been distributed. The November number is practically complete and will be mailed on schedule.

Reports of Committee Chairmen:

Chapters Committee — Mr. Sturgis reported that the Association now has a total of ten chapters. He felt it unnecessary to formally report on the activities of the chapters since full reports are regularly published in the Journal. The two new chapters added during the year 1952 were the Texas Chapter (Houston) and the Upper Midwest Chapter (Rochester, Minn.).

Certification Committee — Mr. Flory stated that President Eddy has already touched upon the fact that his committee felt it necessary to obtain membership opinions on cerification before taking further steps. Much work had been accomplished during the year, and the committee was now in a position to know what questions pertaining to certification had to be clarified before

they could make definite proposals. The Board had approved the preparation and mailing of a questionnaire to all members. The committee then planned to consolidate the findings of the survey and be guided accordingly in its future activities.

Membership Drive Committee — Mr. Tuttle stated the following: "I am glad to report that the committee has been active throughout the entire year and up to the present time we have obtained 359 new members. The Association also now has 131 Contributing Members and 19 Sustaining Members. The total new income resulting from the drive amounted to $3,439.00.

"At the start of the campaign last fall, we were hopeful of getting at least 750 new regular members and a total of about 500 contributing members. Dr. Farris and I were also hopeful of raising $2,000.00 in sustaining memberships. Therefore, the results have fallen considerably short of our initial expectations.

"It is quite possible that we can attain this goal but it may mean that it will take 2 or 3 years to accomplish it instead of the one year we had originally estimated.

Most of the 359 new members were obtained through the efforts of about 50 members. If every member of B.P.A. would get one new member, we would have no difficulty in reaching our goal. We look forward to receiving each member's full cooperation."

Nominating Committee — Mr. Harding, Chairman, announced that he and his committee members, Mr. Flory and Mrs. Ikenberg, had drawn up the following slate:

President	C. Graham Eddy
Vice President	Warren Sturgis
Secretary	Jane H. Waters
Treasurer	Albert Levin
Director	David Lubin
Director	Laurence Brown
Director	Chester Reather

Salon Committee — Mr. Gibson complimented the New York Salon Chairman, Mr. Sid Shapiro, and his committee members, on their excellent performance in handling the salon exhibition for the Annual Meeting. He asked that all members continue to cooperate in submitting salon prints for use in the Association's Traveling Salon.

Annual Meeting for 1953: Miss Gregersen announced that the dates for the Los Angeles meeting would be August 31st to September 3rd. The Hotel Statler had been chosen for the meeting headquarters. Mr. William Martinsen had been selected by the Southern California Chapter to act as General Chairman.

Invitations for 1954 Annual Meeting City: Only one proposal was received from the floor. Mr. William Taylor, in behalf of the Philadelphia Chapter, invited the Association to hold the 1954 meeting in Atlantic City.

A previous invitation from Quebec was recalled because it was felt that the members in the Quebec area were not quite ready to take on the job. However, the membership was asked to keep Quebec in mind for sometime in the future.

Salon Judging: Mr. Eddy announced that the judging of the salon had been done on a somewhat new basis. He called on Margaret Markham to explain. Miss Markham stated that the judges themselves had been responsible for introducing a new factor in the judging of salon prints and transparency exhibits. She stated that the Judging Committee felt that the manner and elegance of presentation had to be considered in addition to the usual photographic merits of a salon entry. A new class of recognition had also been established for certain prints that warranted consideration even though they did not qualify as award winners. This recognition was made by placing a yellow ribbon on the salon entry.

Second Business Meeting:

Election of Officers and Directors: Mr. Harding again read the slate as presented at the First Business Meeting. Mr. Eddy explained that write-in nominees, although allowed by the By-Laws, had not been received. He requested someone to move that the Secretary cast a ballot for the entire membership approving the slate. The motion was made, seconded and approved.

1954 Annual Meeting City: Since Atlantic City was the only place proposed during the First Business Meeting, the membership moved to accept the invitation of the Philadelphia Chapter. The motion was carried with hearty approval.

Auditing Committee Report: Mr. Martinsen stated that he and Miss Shiras had examined the Treasurer's reports and had found them in good order.

Motion Picture Committee: The Chairman of the Motion Picture Committee had not been present during the First Business Meeting and so he was called on for brief comments. Dr. Buchsbaum stated that the Committee was active but was not ready to present a formal report. He called for a meeting of those committee members present immediately after the business session.

Certification: Mr. Lubin asked that the motion which had been brought forth at the Business Meeting during the Boston Annual Meeting be read for discussion. The Secretary read the motion from the minutes. After considerable discussion, Mr. Lubin requested that his motion be withdrawn. He agreed with other members who felt that no definite vote should be taken on the previous motion until the Certification Committee had an opportunity to survey the entire membership.

New Business: Mr. Yamamoto proposed that some way be found to disseminate certain worthwhile Journal papers beyond the bounds of the B.P.A. membership. It was moved that the President appoint a committee to study the possibilities of Mr. Yamamoto's proposal. The motion was seconded. After a lively discussion the motion was revised to comply with Mr. Eddy's desires to put the matter in the hands of the Motion Picture Committee. This motion was approved.

A representative from the Texas Chapter proposed that the Journal and the B.P.A. stationery carry a sub-heading to indicate the broad scope of biological photography. This had been proposed previously by Mr. Tuttle. He requested that a committee be appointed to study what branches of science the Association encompasses because he felt that too many people looked upon biological photography as medical photography. Mr. Eddy asked Dr. Richards to look into the situation, but Dr. Richards felt there was no need for this since medicine is only a branch of biology. However, Mr. Harding thought that it would be helpful to clarify the definition of biological photography if a sub-heading were used. Mr. Eddy then called for a vote on whether or not a committee should be appointed. After the proposal received membership approval, Mr. Eddy appointed Mr. Winburne to act as chairman of the committee, with Dr. Richards and Mr. Harding serving with him.

Mr. Gibson announced that Mr. Sidney Shapiro would be chairman of the Traveling Salon Committee beginning in 1953.

Mr. Bergman suggested that prints made especially for reproduction should be considered as a separate salon category. President Eddy referred this suggestion to the Los Angeles group and to Mr. Gibson for further consideration.

Mr. LeDoux requested that any old pictures taken during the early B.P.A. annual meetings be sent to him for the historical record albums. He then presented two albums to the Association containing pictures which he had made during the annual meetings of the past few years. Mr. Eddy asked Mr. LeDoux to continue as Official Photographer and thanked him for his energetic work. Mr. LeDoux pointed out that he had taken the pictures and made the prints, but that the Eastman Kodak Company had furnished the albums. Mr. Eddy expressed thanks to both Mr. LeDoux and the Eastman Kodak Company in behalf of the Association.

Dr. Richards moved that a vote of thanks be extended to the New York group for the grand meeting they had made possible. This was seconded and approved.

Adjourned 1:00 p.m.

(Signed) LLOYD E. VARDEN, *Secretary*

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John Ross Murray

John Ross Murray was born in Newport, Kentucky on September 20th, 1889, but spent most of his youth in Middletown, Ohio. After his father's death in 1907 a friend of the family taught John the barber trade and he later had a shop of his own until the flood destroyed most of his equipment in 1913. From early youth he was interested in photography. Before going to St. Vincent's Hospital in charge of their photographic department some five or six years ago, John was employed in the Photographic Department of the Atlas Powder Company, Ravena, Ohio. He was a member of the Biological Photographic Association for five years at Cleveland, Ohio. Stricken by a heart attack on December 23rd, death came on the morning of April 28th, 1952. Funeral services were held in Cleveland and burial was in the family plot in Middletown, Ohio. The American Legion Post 218, of which he was a member, conducted funeral services at the grave with full military rites. His flag was presented to his sister Ada, who with her family mourn his death. — J.M.

Book Reviews

The Preparation of Photographic Prints for Medical Publication. **Stanley J. McComb, FBPA. Charles C. Thomas, Springfield, Illinois. 1950. v + 69 pp. Illus. $2.00.**

This small manual is directed to the inexperienced beginner in medical photography and to the physician requiring his services. It embodies in simple form the elementary requirements of medical photography, which are, in fact, the basis of illustrative photography in general. Sections are devoted to sharpness of focus, scale, size, position, backgrounds, lighting, print quality, trimming and grouping. In quality, the illustrations are as nearly perfect as one is likely to find in any medical journal; the arrangement, at least in the opinion of this reviewer, leaves

much to be desired; as for example, assigning the same figure number to no less than four pictures, spread out over three pages, with one of the legends on still a fourth page. Most medical editors have their own ideas on arrangement, with the logical purpose of preserving a harmonious appearance from one article to the next and their best efforts are sometimes thwarted when the photographer mounts his own page arrangements; so that the author's advice, to seek editorial approval before multiple mounting is attempted, is sound.

One hopes that the success of this small monograph may stimulate the author to supplement it with a much more comprehensive opus on the subject. There is a crying need for such a book and the present author's wide experience should furnish him both the judgment and the material necessary to the project. — M.D.

The Merck Index of Chemicals and Drugs. **Merck & Co., Rahway, N.J. 1952. xiv+1167 pp. 6th Ed. $7.50, with thumb index $8.00.**

For years one has turned to this index for chemical information and the new, larger and more complete edition is welcome. Most chemicals and drugs are listed with their chemical and physical characteristics and uses. This edition adds the minerals into the body of the book and has new data on indicators, standard buffers, acid and base concentrations, symbols, first aid and poisons, wet-dry basis and a logarithm table. Omitted are chemical and clinical reactions, culture media, staining solutions and fixatives. Thus the biologist will need keep his fifth edition. In their place is a list of organic "Name" reactions. There is no comparable volume in English and biologists and many photographers will find the Merck Index a most useful reference book.—O.W.R.

Modern Control in Photography, **Edited by John Erith, The Fountain Press, London, 1951, 215 pages, stiff paper bound, 27 s. 6 d. (Books published by Fountain Press are available in this country through Rayelle Foreign Trade Service, 5700 Oxford St., Philadelphia 31, Penna.)**

Although the biological photographer is not usually interested in control processes as employed by pictorialists, there is much contained in this volume concerning control that will lead any working photographer to more consistent, high-quality results. The book consists of eight main chapters, each written by a separate specialist. The titles of the chapters give an indication of the book's contents, namely, Control in Pictorial Photography, Control in Portraiture, Control in Commercial and Industrial Photography, Control in Advertising Photography, Control in Theatre Photography, Control in Color Photography, Control in the Darkroom, and Control in Fashion Photography. These headings may not seem too attractive to the biological and medical photographer, but most of the basic principles and techniques brought out in the chapters are fully applicable to scientific work—L.E.V.

Index Volume 20, 1952

Animal Photography ----72
Autoradiograms ----52
Babcock, C. E. ----152
Bennett, A. H. ----86
Biological Photographic Association
  Association News ----33, 88, 133, 146
  Chapter News ----33, 88, 134
  Committee Reports
    Motion Picture ----136
    Nominating ----133
  Contributing Members ----2, 92, 137
  Journal ----133, 146
    Back issues available----160
  Meeting, Annual
    Los Angeles, 1953 ----37
    New York, 1952 ----51, 98, 175
  Membership Drive ----90
  Officers ----2nd cover
  Sustaining Members ----2, 92, 137, 187
Breckenridge, E. M. S. ----126
Brubaker, J. D. ----81, 103
Camera, Care ----152
  Cavity ----81, 103
  Intraflex ----75
  Photomicrographic ----127
Cavity Photography ----81, 103
Cinefluorography ----14
Color, Book on ----174
Coloring Lantern Slides ----45
Copying Microfilm ----25
Davis, L. R. ----161
Dooman, J. ----127
Dragesco, J. ----72, 100
Egger, F. C. ----147
Engle, C. E. ----52, 165
Erith, J. ----191
Flash, Electronic ----72
Footprints ----165
Bibson, H. L. ----139
Green, W. H. ---- 3
Hansell, P. ----28
Hepler, O. E. ----132
Hoecker, F. E. ----52
Holme, B. ----80
Horses ----80
Huselton, M. L. ----168
Illumination, Transparencies ----122, 161
Illustration, Lantern Slides ----168
  Medical ----28, 190
Imms, A. D. ----61
Insects ----61
Instruction ----129, 147
Intern'l Sci. Film Assoc.----62
Intraflex Camera ----75
Jenkins, F. A. ----32
Johnstone, G. R. ----21
Judd, D. B. ----174
Jupnik, H. ----86
Korson, R. ----45
Lantern Slides ----20, 45, 168
LaRue, M. W. ----65
Lens Testing ----100
Lindsay. C. ----41
Linssen, E. F. ----174
Magnification ----21
Mallory, F. C. ----45
Maresh, C. ----168
Markets ----71, 74, 96, 151
McComb, S. J. ----190
Medical & Biol. Illustra. ----87, 144
  Illustration ----28, 139, 190
  Photogr. Gt. Britain ----41
Meiller, F. H. ----59
Merck Index ----191
Microfilm Copying ----24
Microscopy, Phase ----86
Microtechnic ----44, 132
Neblette, C. B. ----121
Negatives, Marking ----126
  Paper, in Photomic ----59
New Products ----46, 94, 140
Optics ----32, 181
Osterberg, H. ----86
Pesyk, L. ----168
Photoflash, Electronic ----72
  Effect on Vision ----35
Photography ----102
  Animal ----61, 72
  Books ----13, 102, 121, 191
  Dictionary ----13
  Endoscopic ----81, 103
  Footprints ----165
  Instruction ----129, 147
  Medical ----28, 139, 141, 190
  Optics ----32, 181
  Stereoscopic ----174
Photomicrography Apparatus ----65, 127
  Autoradiographs ----52
  Low Power ----127
  Magnification ----21
  Motion Picture ----65
  Paper Negatives in ----59
Porter, D. A. ----161
Prints for Publication ----3, 190
Ramsay, G. H. S. ----14
Richards, O. W. ----86, 146
Roofe, P. G. ----52
Rochester Gen. Hosp. School----129
  Univ. of, Med. School ----14
Sass, J. E. ----44
Sears, F. W. ----89
Selye, H. ----86
Stadler, A. ----37
Sturgis, W. ----75
Teaching Aids ----122
Transparencies ----122, 161
Tuttle, H. B. ----37, 90
Viewing Boxes ----122, 161
Wang, H. ----127
Watson, J. S. ----14
Weinberg, S. A. ----14
White, H. E. ----32
Wilkinson, P. N. ----52
Yamamoto, V. Y. ----122

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Manuscripts should be sent to The Editor, Journal of the Biological Photographic Association, 70 Alton Road, Stamford, Conn.

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Book—Valasek, J. 1949. *Introduction to theoretical and experimental optics.* John Wiley & Sons, N. Y. x+454 pp.

Journal Article—Carman, P. D. 1949. Photogrammetric errors from Camera lens decentering. J. Opt. Soc. Am. 39(11):951-954.

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CONTENTS

Editorial — Our Journal ---- 146

Association News ---- 146

Egger, F. C. Program of Instruction for Medical Clinical Photographers ---- 147

Unusual Photographs Needed ---- 151

Babcock, C. E. Care and Upkeep of Cameras ---- 152

Back Numbers of Journal Available ---- 160

Davis, L. R. and D. A. Porter, Some Viewing Devices for Transparencies ---- 161

Engle, C. E. Footprints ---- 165

Maresh, C., Pesyk, L., and M. L. Huselton, Improvements in Presentation of Material with Lantern Slides ---- 168

Book Reviews: Stereo-Photography by Linssen, Color in Business, Science and Industry by Judd ---- 174

22nd Annual Meeting ---- 175

Sustaining Members ---- 187

Contributing Members ---- 188

Obituary: John Ross Murray ---- 190

Book Reviews: Preparation of Medical Prints for Medical Illustration by McComb ---- 190

The Merck Index

Modern Control in Photography by Erith ---- 191

Index for Volume 20 ---- 192